# The making of hazard: a social-environmental explanation of vulnerability to drought in Djibouti

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# The making of a hazard: a social-environmental explanation of vulnerability to drought in Djibouti

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For the degree of Doctor of Philosophy
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*"The key to riding the wave of chaos is not to resist it, but to allow yourself to know you are a part of the energy of chaos, allowing a new form of organization in it, rather than imposing your old system organization upon it.*

- Bashar

# Abstract

This research addresses the aetiology of current chronic socio-environmental vulnerability of rural households to the hazard known as 'drought' in the country of Djibouti.

Tracing the main forces of change affecting the sustainable practice of pastoralism is akin to studying the social production of vulnerability. The exercise forms an integral part of Wisner et al's Disaster Pressure and Release (PAR) model which is used here to shed light on the mechanisms and the path of change from root causes of vulnerability up to the appearance of unsafe conditions. Based on information from primary research conducted with pastoral communities, relevant secondary sources and raw historical rainfall data, the study generates novel data on communities' exposure to risk, vulnerability and coping capacities associated with food insecurity in the face of drought.

The first part of the thesis explores the 'root causes' of vulnerability to drought in Djibouti, i.e. the process of border-making, the imposition of geographical boundaries to pastoral life, division and power disequilibrium between the Afars and the Somali-Ise and the gradual weakening of traditional organizational systems' legitimacy. The second link in the chain of explanation corresponds to dynamic processes which are by-products of root causes. They include regional and internal influences on rurality and the effects of Djibouti's progressive entry into the world economy on rural livelihoods. Finally, the third part of the thesis investigates the nature and creation of 'unsafe conditions' of the Afar and Somali-Ise pastoral communities under study. These conditions correspond to hazardous locations of living, the fragility of pastoral livelihoods and the reinforcing impacts from non-drought hazards on their vulnerability to drought.

The thesis demonstrates that rather than the hazard itself, it is the historical accumulation of factors of vulnerability and eventually the nature of current rural households' unsafe conditions that are responsible for their present chronic vulnerability to drought in the study areas.

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# Table of Contents

# List of Tables

# List of Figures

# Acronyms

ACF - Action Against Hunger

AfDB - African Development Bank

ARTEMIS - Advanced Real Time Environmental Monitoring Information System

ASALs - Arid and Semi-Arid Lands

CERD - Research and Studies Centre of Djibouti

CFS - Côte Française des Somalis

CFW – Cash for Work

CMH - Centre Médico-Hospitalier (Dikhil region's main hospital)

CRB - Croix-Rouge Britannique

CRD - Croissant Rouge de Djibouti

CSI - Coping Strategy Index

DRM - Disaster Risk Management

DRR - Disaster Risk Reduction

EM-DAT - International Emergency Disasters Database

FAD - African Development Fund

FAO-UN - Food and Agriculture Organization of the United Nations

FFW - Food for Work

FRUD - Front pour la Restauration de l'Unité et la Démocratie

GDP - Gross Domestic Product

GEC - Global Environmental Change

GHA - Greater Horn of Africa (Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, South Sudan, Sudan, Tanzania, Uganda)

GIEWS - Global Information and Early Warning System

GoD - Government of Djibouti

HoA - Horn of Africa (Djibouti, Eritrea, Ethiopia and Somalia)

ILRI - International Livestock Research Institute

IMF - International Monetary Fund

IPC - Integrated Food Insecurity Phase Classification

MAPE-RH - Ministry of Agriculture, Water, Fishing, Livestock and Fishery Resources

MEFPP - Ministry of Economy, Finance and Planning in charge of Privatization

METEOSAT – Meteorological Satellites

MHUEAT - Ministry of Housing Urban Planning the Environment and Land Management

MID - Ministry of Interior of Djibouti

NDVI - Normalized Difference Vegetation Index

NGO - Non-Governmental Organization

ONEAD - National Office for Water and Sanitation of Djibouti

PAR – Pressure and Release

PIP - Public Investment Programmes

PVCA - Participatory Vulnerability and Capacity Assessment

SAPs - Structural Adjustment Programmes

SES - Socio-Ecological Systems

SSTs - Sea-Surface Temperatures

TFAI - Territoire Français des Afars et des Issas

UNDP - United Nations Development Programme

UNOCHA - United Nations Office for the Coordination of Humanitarian Affairs

WB - World Bank

WFP - World Food Programme

WHO - World Health Organization

# Glossary

*Afqaloociya*: hollow-mouth (drought)

*Arbaca*: Wednesday (drought)

*Axad*: Sunday (drought)

*Badhi*: sheep's tail

*Badia*: countryside

*Barariya*: swelling (drought)

*Baris*: rice

*Ceel*: well

*Daboita*: Afar hut

*Dardar*: Afar tribal chief

*Deyr/kudo*: autumn rainy season

*Dhul cas*: red earth

*Dhul madow*: black earth

*Diqiiq*: flour

*Diraac*/*sougoum*: spring rainy season

*Fi'ma*: Afar council of notables

*Gendi*: Somali council of notables

*Hagaa*: summer calendar season

*Jaarka*: neighbourhood in Somali

*Jilaal*: winter calendar season

*Karan/karma*: summer rainy season

*Karkabi*: camel skin

*Noris*: bleeding

*Nus*: half in Somali

*Okal:* local community chief/notable paid by the State

*Orod wayne*: run-away (drought)

*Qaxoonti*: refugee

*Reer guraa*: moving families (nomads)

*Reer*: family/clan family in Somali

*Sabbti*: Saturday (drought)

*Saliid*: oil

*Siigo cas*: red wind (drought)

*Siigo dheer*: long wind (drought)

*Subak*: butter

*Toukoul*: Somali hut

*Ugas*: leader of the Somali-Ise

*Xays/dadaac*: coastal winter rainy season

# 1 Introduction

## 1.1 Statement of the problem

On June 23rd 2010, the European Commissioner Kristalina Georgieva who heads the European humanitarian aid and crisis response portfolio announced a €20 million (US$26 million) package for six countries in the Horn of Africa (HoA) region. On August 13th 2010 in Nairobi, she was quoted as saying that "Drought is by far the main cause of natural disasters in the Greater Horn of Africa" (IRIN 2010). The following year, the media reported that Djibouti and the HoA in general were hit by a severe drought said to be the "worst in 60 years" (Brown 2011).

Clearly, drought[1] was seen as the main culprit behind chronic food crises in the arid and semi-arid lands (ASALs) of the HoA. It was reported to be responsible for loss of livestock, diminishing income, rising food prices and exodus to the cities (IRIN 2011, Roux 2011, Tran 2011, Jenkins 2014). In Djibouti, drought occurrence is not new and is a normal feature of climate (Patrick Webb 1993, Piguet 1998, p.140). The International Emergency Disasters Database (EM-DAT) recorded a decade of over four droughts (2001, 2005, 2008, 2011) having respectively affected 100 000, 150 000, 340 000 and 120 000 people in rural Djibouti (PreventionWeb 2008, Brown 2011).

In the academic literature, there has been some renewed interest in understanding the dynamics involved in the unfolding of drought-related famines and food crises in the HoA, especially in Ethiopia (Hammond et al. 2002, Hassen 2008, Jufare 2008, Lupai 2008). However, no in-depth study was found on trying to uncover the construction of vulnerability to drought in the particular political ecological and historical context that characterizes Djibouti. It is possible for an extended period of aridity (including drought) to severely affect food supply. However, is drought the sole cause of food insecurity in rural Djibouti? Has the intensity, duration and/or frequency of drought increased or is it rather due to underlying causes of rural vulnerability?

[1] It is useful to specify here that the term 'drought' refers specifically to 'meteorological' drought throughout the thesis. A discussion of the various drought types and the definition adopted in this study is offered in Chapter Two and Chapter Six.

Given the recurrent nature of droughts and food crises, it is necessary to investigate both the nature of traditional coping and adaptation mechanisms and relatively recent climatic patterns of rainfall. At this early stage, it is useful to define the overall goal of this research. This study unpacks the social and environmental factors of vulnerability to drought in rural Djibouti. It hypothesizes that beyond the mere occurrence of droughts, the problem of chronic hunger and food crises that has taken hold in rural Djibouti is linked to underlying structural causes which have increased pastoral societies' vulnerability to drought.

Drought is a natural phenomenon characterized by a delayed and/or below-normal amount of rainfall (Wilhite et al. 1985) which recurrently impacts the seasonal yields of farmers and agro-pastoralists (Meze-Hausken 2004, Cheung et al. 2008, Iglesias et al. 2009). It is a recurrent hazard in the HoA that frequently undermines rural livelihoods as a contributing factor to food insecurity (Wolde-Mariam 1986, p.127, Dejene 1990, p.85-86, Webb et al. 1994, p.37-38, Diriba 1995, p.50, Jufare 2008) and a major reason why 97% of pastoralists, agro-pastoralists and farmers in rural Djibouti were estimated to be living under the poverty threshold in 2004 (FAD 2004b). In Djibouti, an evaluation project on drought-related impacts was jointly completed by the Interior Ministry (MID) and international partners in 2010. The report states that the vulnerability of pastoral communities is due to repeated drought-related shocks which have progressively eroded their livelihoods and therefore increased their vulnerability (MID 2010). The most important factors identified were difficult access to potable water, overexploitation of present hydraulic resources, decreased income due to loss of livestock and higher dependency on external food aid (Lopez et al. 2010). However, there is an important conceptual difference between discussing the impacts of drought and studying the aetiology of vulnerability behind these impacts. The question that should be asked is why have pastoral livelihoods been eroded in the face of droughts?

To answer this question, it is imperative to retrace the main forces of change affecting the sustainable practice of pastoralism which is an endeavour akin to studying the social production of vulnerability. This exercise, which is framed through the use of the Pressure and Release (PAR) model put forward by Wisner et al (2004, p.49-56), sheds light on the mechanisms and the path of change from root causes of vulnerability up to the appearance of unsafe conditions. Based on information extracted from relevant reports, articles, books, historical rainfall data and primary

qualitative data collected in the field, the study intends to generate novel data on communities' exposure to risk, their vulnerability and their adaptive capacity associated with food insecurity in the face of drought.

## 1.2 Research question, hypotheses and objectives of the study

This thesis postulates that rural food insecurity is the product of interactions between 'normal' drought(s) and social-environmental factors of vulnerability. Despite the scant literature on the subject for Djibouti, study reports on pastoralists' vulnerability to drought have put forward various explanations ranging from market price fluctuations and decreased food supply to deeply social factors such as conflict and entitlement failure due to institutional change as possible drivers of food insecurity. Other projects more focused on digging up the intricacies of real-time vulnerability have come up with a range of vulnerability frameworks and models for immediate response and action on the short and medium term. However, no in-depth study was undertaken to assess the possible role of historical factors in accounting for present chronic vulnerability to drought in rural Djibouti.

The main research question to be answered is the following:

- **What are the social-environmental elements involved in the production of rural vulnerability to drought in Djibouti?**

To answer the aforementioned research question, the study was guided by five research sub-questions:

1. What are the root causes of change in the pastoral landscape responsible for giving rise to vulnerability in rural areas of Djibouti?

2. What are the dynamic processes involved in reinforcing the effects of root causes on rural vulnerability through time and space?

3. What are the main unsafe conditions within which human vulnerability to drought is expressed in rural areas?

4. What is the nature of pastoralists' current vulnerability and adaptive capacity to drought?

5. What are the climate dynamics behind the occurrence of droughts in Dikhil region?

Although part of the thesis deals with the theoretical underpinnings of the geographical perspective adopted in this research project, it is an empirical study grounded in current theoretical debates within disaster risk studies. Theory must be coherent with the methodology that is adopted. Given the background to the research problem, this present research will start from and is guided by the following working hypotheses:

a) Based on their local traditional survival strategies, risk perception and indigenous knowledge, rural communities have been able to withstand socio-environmental shocks and stresses for generations. However, their present assumed heightened level of vulnerability stems from unequal competition of systems of signification over land management and its use.

b) From the pre-colonial period until now, there has been a progressive change from a system of power imbalance between rural households and the central government to a system of domination which ultimately led to the marginalization of rural households.

c) The severity and frequency of droughts has not increased in the Republic of Djibouti. Despite recent attempts to address the present chronic food insecurity of rural households, their vulnerability to drought has increased since the 1980s due to the progressive increase of rural households' vulnerability and powerlessness to manage it in the face of drought.

d) As factors of vulnerability historically accumulated and laid the ground for unsafe conditions to take hold in rural areas, pastoralists' vulnerability to drought has steadily been increasing through time.

Based on the research problem as stated in section 1.1, this research project has the following specific objectives:

i. To investigate the nature and flexibility of rural households' pastoral system in pre-colonial time and therefore re-present the array of constraints and opportunities offered to them in the face of droughts.
ii. To unearth and explain how changes in land management and use affected rural households' sustainable practice of pastoralism.
iii. To analyse the progressive shift of socio-economic power centres from within rural communities to Djibouti city and its impacts on rural livelihoods.
iv. To assess and define recent climatic variability and the occurrence of drought in rural Djibouti.
v. To unravel dynamic connections between root causes and current rural households' unsafe conditions of living.
vi. To define and evaluate rural households' present vulnerability and adaptive capacity to drought.

## 1.3 Contextualizing the study in time and space

Fieldwork was carried out in several villages of Dikhil region in Djibouti. Dikhil is the largest of the five regions of the Republic of Djibouti covering a surface of about 6 800 $km^2$ which corresponds to about 30% of the national territory. According to results from the latest national survey completed in 2009, there were about 65 000 inhabitants living in Dikhil which was about 9% of the total Djiboutian population. Assuming there were about 6.6 persons by household, there would be around 9 800 households in total (MID 2009). Another survey from the same year, however, indicated a population of 88 948 inhabitants (Silah-Eddine 2011, p.13) which was nearly a third more. Evidently the exact population number is not precisely known. In part, this may reflect the difficulties of enumerating nomadic populations since the latter survey estimated that 46.7% of the population was rural and nomadic, 25.3% rural and sedentary and 27.9% urban.

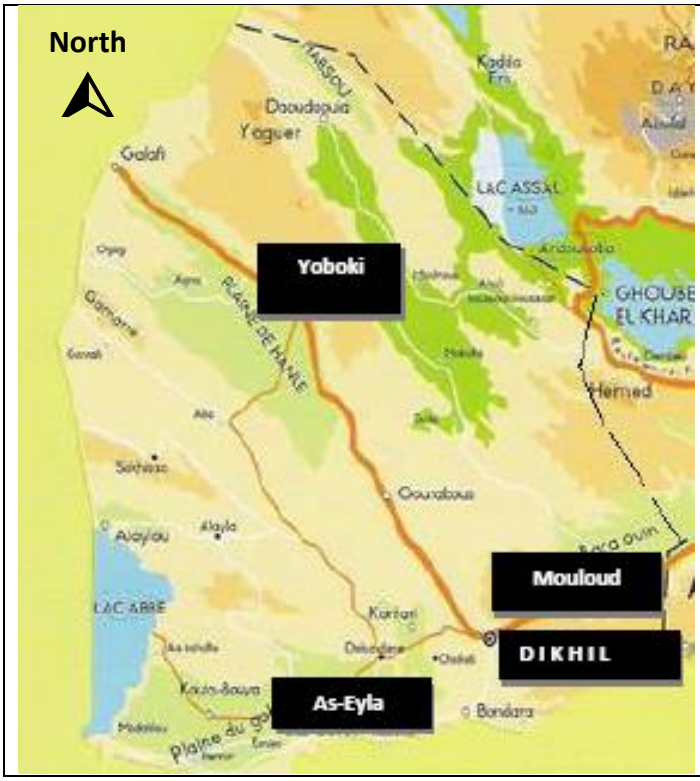
The population of Dikhil region is drawn from two sociolinguistic people, the Afars and the Somalis-Ise. As shown in Figure 1.1 and confirmed by a government study report (MID 2009), the majority of the regional population was found in the sub-prefecture of Yoboki (about 28% of the population), Dikhil City and its suburbs (23%) and in the sub-prefecture of As-Eyla (18%). Most of the region comprises the Sultanate of Gobaad's territory and the Debné Chiefdom, which were inhabited by the Afars. The rest of the territory to the Eastern side of the region was inhabited by the Somalis-Ise.

Dikhil region is mainly characterized by its livestock and agricultural production from various agro-pastoral and agricultural plots found throughout the region. Some are owned by local associations called 'cooperatives' while others were owned by individuals. With its market centre in Dikhil city, daily local commercial activities would take place with frequent camel caravans crossing the border with Ethiopia for local trade (sometimes illicit like the commerce of cigarettes and *khat*[2]) of various goods. Its proximity with the Ethiopian border and the marketing exchanges created before the 1991-1994 war between the Somali-Ise government of then President Haj Hassan Gouled and the Afar-dominated *Front pour la Restauration de l'Unité et la Démocratie* (FRUD) made Dikhil a major regional trans-border trading node. With 200 kilometres of its border shared with Ethiopia, there is constant local livestock trade and contraband from Galafi (border Afar village North-West of Dikhil region) to Bondora (border Somali-Ise village south-centre of Dikhil region). Environmentally speaking, Dikhil is mainly characterized by an ecosystem of plains with two main *oueds* traversing it, namely the Gobaad and Hanlé *oueds*. Occasional sudden strong water flows in times of irregular intense rainfall can destroy agricultural plots set up along the banks of these *oueds* and silt up nearby wells built for animal and human consumption.

Fieldwork took place in five villages: Sankal, Hanlé 2, Koutabouya, Bondora and Dadahalou. Their location can be seen in Figure 1.2. The first phase of fieldwork took place in Sankal between October 2011 and February 2012 while the second phase took place in the remaining villages from March to October 2013.

[2] *Khat* is a plant masticated and consumed for its euphoric properties. It often originates from neighboring Ethiopia and is consumed by over 80-85% of men in Djibouti. It is listed as an addictive drug and is forbidden in several countries around the world.

**Figure 1.1 Dikhil region and its main centres**




**Main data**
Surface: about 6 888 km2
Population: about 65 000 people
Density: about 9 inhabitants/km2

**Main centres**
Dikhil Prefecture: about 15 000 inhabitants
Yoboki Sub-prefecture: about 18 000 inhabitants
As-Eyla Sub-prefecture: about 12 000 inhabitants
Mouloud Sub-prefecture: about 10 000 inhabitants

**Main distances**
Dikhil to Djibouti City: 120 km (2 hour-drive)
Dikhil to Yoboki: 75 km (1 hour 30 minutes by car)
Dikhil to Mouloud: 15 km (20 minutes by car)
Dikhil to As-Eyla: 30 km (1 hour-drive)

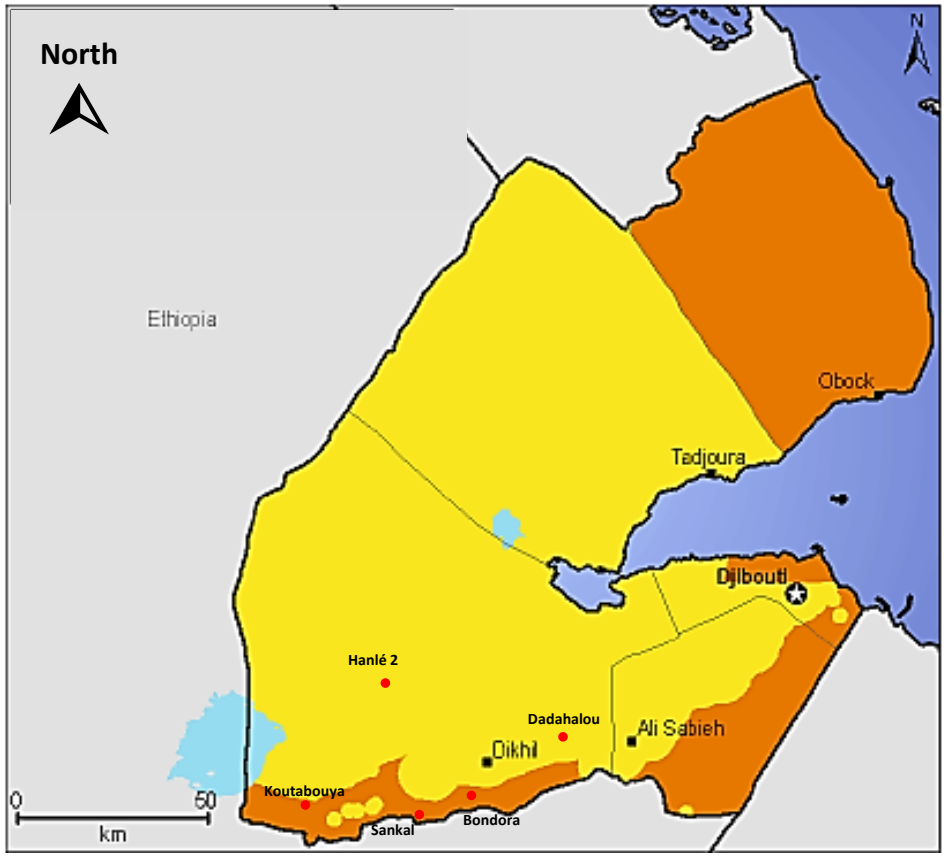
*Source: Adapted by author from MID, 2009, p.4*

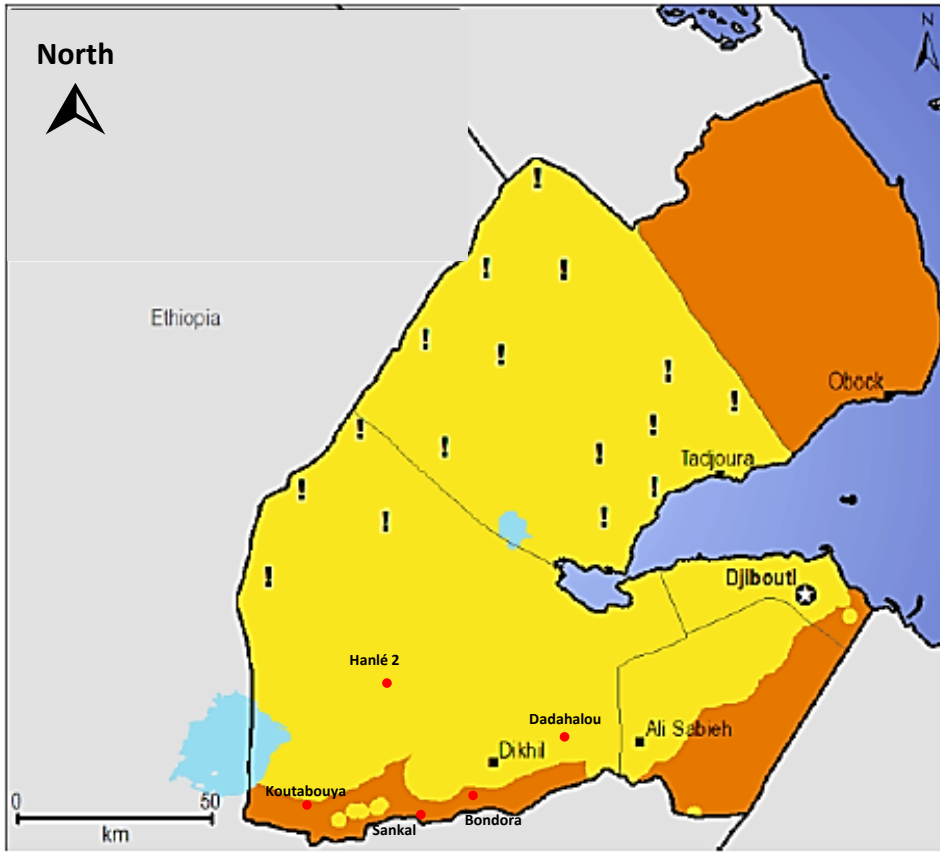
In the months prior to July 2013, the performance of the *xays/dadaac* (October to March rainy season) was deemed inferior to the normal average (FEWS-Net 2013a, FEWS-Net 2013b). As a result, the landscape inland exhibited dry vegetation and bare lands.

In December 2012, a series of workshops was organized by the Food and Agriculture Organization of the United Nations (FAO-UN) with the participation of government officials in Djibouti city, representatives from the countryside, international consultants, including the present author to produce the 2013 Integrated Food Security Phase classification. The exercise relied on the analysis of recent data across various sectors linked to food security added to focus groups and discussions.

As shown in the Integrated Food Insecurity Phase Classification (IPC) maps of Figure 1.2, most of Dikhil region was classified in Phase 2 or at stress level.

**Figure 1.2 IPC of Acute Food Insecurity from February to March 2013 in Djibouti**




**IPC V2.0 Acute Food Insecurity Phase Classification**

- 1: None or Minimal
- 2: Stress
- 3: Crisis
- 4: Emergency
- 5: Catastrophe/Famine
- Study Sites

**IPC V2.0 Acute Food Insecurity Phase Classification**

- 1: None or Minimal
- 2: Stress
- 3: Crisis
- 4: Emergency
- 5: Catastrophe/Famine
- ! Probably worse without the ongoing or planned humanitarian assistance
- Study Sites

*Source: FEWS-Net, 2013a and FEWS-Net, 2013b*

This means that these zones exhibited at least one in five households suffering from reduced and inadequate food consumption but without engaging in irreversible adaptation strategies. These households could not afford to spend money in certain essential non-food items. In comparison, the South-Eastern part of Dikhil region (including Koutabouya, Sankal and Bondora study sites) was classified in Phase 3 or at crisis level (FEWS-Net 2013a). This signifies that at least one household living in those zones was experiencing considerable food deficits and suffering from acute malnutrition with rates equal or superior to normal. Further, it implied that at least one in five households could not cover its minimal food needs without resorting to irreversible adaptation strategies. According to a local rural study on food insecurity completed in July 2013, 70.1% of Dikhil's population was classified as moderate or acute food insecure (WFP 2013, p.10).

All in all, the zones under study exhibited means of subsistence increasingly under pressure with income and food sources at risk of not permitting those households affected to cover their food needs. Figure 1.2 further showed that from February to March 2013, food insecurity conditions deteriorated in the North-Western part of Dikhil region with the area going from merely being at stress level to a level where food insecurity conditions would probably have been worse without the ongoing or planned humanitarian assistance taking place. Although the price of foodstuffs was still below or equal to previous year's prices and to those of the three-year average, food expenditure costs were unbearable for most households as those prices remained above their purchasing power (FEWS-Net 2013b). This research study intends to uncover the structural causes behind current rural food insecurity in the study zones. To answer the main research question, the overall organisation of the thesis was guided by the research sub-questions and the specific objectives stated in section 1.2.

## 1.4 Organisation of the thesis

The entire thesis is organised in nine chapters (including the current one) with the first three discussing and defining the conceptual and practical parameters of the research whereas the remaining six chapters discuss the results obtained.

Before embarking on the research, it is crucial to define the terminology and set the framework used for this study. Thus, **Chapter Two** discusses the concepts of 'drought', 'vulnerability' and the various uses of the terms within various schools of thought and models before justifying the election of the PAR model for this study.

**Chapter Three** discusses the geographical perspective chosen for this study and its methodological and scalar implications. It also outlines the methods used for primary and secondary data collection and analysis including some of the challenges faced in the field.

The origins of pastoralism and the social-environmental linkages that define it are examined in **Chapter Four**. After introducing the people under study, the chapter unveils the historical or root causes of current vulnerability to drought. The chapter mainly discusses secondary data obtained from study reports and historical books covering the colonisation period.

In continuation with root causes, **Chapter Five** discusses the second stage of the PAR model in the production of vulnerability which corresponds to the reinforcing effects of dynamic pressures on pastoralists' vulnerability to drought. More contemporary, these factors enclose rural migrations, regional dynamics of conflict over pasture lands and after-effects of Djibouti's integration to the world economy.

**Chapter Six** investigates the drivers of climate and drought occurrence in rural Djibouti and more specifically in Dikhil region. It includes rainfall data analysis and a discussion on past rainfall trends in the HoA, Dikhil region and the Issa ecosystem to which the study sites belong. Finally, the chapter makes comparative findings between rainfall satellite data and pastoralists' perceived changes in rainfall behaviour.

**Chapter Seven** bridges root causes and dynamic pressures with unsafe conditions. The sedentarization process is discussed as a rural adaptive strategy and local dynamic pressure on natural resources. It relies on qualitative results from semi-structured interviews, ethnographic work and the application of participatory vulnerability and capacity assessments (PVCAs) in the study sites.

The last stage in vulnerability production is covered in **Chapter Eight**. It discusses sedentarization's impacts and the role of unsafe conditions in affecting current rural

vulnerability to drought. It presents and analyses additional fieldwork results through the use of the PVCAs and the coping strategy indexes (CSIs). It also discusses the nature of governmental and humanitarian assistance programmes implemented in rural areas in addressing drought impacts on households' livelihoods.

Finally, **Chapter Nine** concludes the thesis with a discussion of the main empirical and theoretical findings from Chapter Four, Five, Six, Seven and Eight relevant to the research question and sub-questions of Chapter One. It answers the main research question by debunking three food insecurity myths with regards to pastoralists' responsibility in degrading the land, the effects of Djibouti's integration to the world economy on pastoral livelihoods and the relationship between drought and vulnerability in the occurrence of chronic food insecurity crises. Study limitations and opportunities for further research are also proposed.

# 2 Investigating vulnerability to drought: a conceptual literature review

## 2.1 Introduction

This chapter starts by briefly discussing drought and its associated processes as a hazard. In particular, the aim of this section is to understand the environmental linkages between climatic events and natural processes on the ground.

The second section deals with the concept of vulnerability. It intends to uncover the challenges involved in defining it, the main schools of thought in the geographical understanding of vulnerability in general and the various attempts at modelling it.

The third part will present the Pressure and Release (PAR) model, its implications and how it will be used for this study in the search for a social-environmental explanation of vulnerability to drought.

## 2.2 Conceptualizing drought and environmental change

Rural Djibouti presents an environmental and livelihood profile that is strikingly different from its neighbours. For example, Ethiopia has an agricultural sector which employs about 80% of the labour force, accounts for as much as 45% of the national Gross Domestic Product (GDP) and that is overwhelmingly based on rain-fed cultivation with only 1.1% of total land under irrigation. It follows that the amount and temporal distribution of rainfall is one of the most important determining factors in national crop production (Nyssen et al. 2005, Tilahun 2006, Bewket et al. 2007). At the other end, except for 10% of the land, Djibouti's rural landscape is characterized by low fertility soils and very low rainfall which do not allow for rain-fed agriculture to be practised. Pastoralism is thus the most widely exercised rural livelihood activity. Pastoralists are also confronted with hot violent winds usually felt during the hot season from May to October and surface temperatures that can easily reach 40-50 degrees

Celsius. Herds are exposed to recurrent droughts and intense flooding during irregular and concentrated rains which turn dry rivers into fast flowing water currents called *oueds* (Brass et al. 2008). Given the importance of rainfall patterns because of their possible impacts on rural livelihoods in Djibouti and the Horn of Africa, this vulnerability study must first discuss the concept of "drought" as a hazard, its meaning and its use before looking at patterns and interpretations of environmental change in the ASALs of the Horn of Africa.

### 2.2.1 The concept of drought

The lack of progress in drought preparedness planning and the elaboration of drought policies stems from the high degree of complexity that characterizes drought and its definition (Lloyd-Hughes 2013). There is a consensus that drought translates into a deficiency of precipitation below expected or 'normal' quantities. When extended over a certain period, it undermines human needs as well as various environmental processes (Meze-Hausken 2004, Wilhite 2005, p.4, Iglesias et al. 2009, p.3, Mishra et al. 2010). At the 2006 Conference Proceedings on Groundwater for Emergency Situation that took place in Tehran, it was indicated that climatologic drought "could constitute a long term disaster" (Vrba et al. 2006). According to Wilhite (2005), drought in itself is not a disaster. Whether it becomes a disaster is dependent upon the nature of the impacts on populations and the ecology rural livelihoods are dependent upon.

This study considers drought as a hazard that could potentially provoke a disaster but cannot constitute a disaster in itself. Drought is a "temporary aberration, unlike aridity, which is a permanent feature of the climate" (Iglesias et al. 2009, p.3). It is true that it can occur in high as well as in low rainfall areas (Wilhite et al. 1985) which makes it very difficult to define but the occurrence of drought may not necessarily be an "aberration" per se in certain dryland environments (Mishra et al. 2010). As a creeping phenomenon with its slow onset and end, drought is considered as a relative rather than an absolute condition (Tsakiris et al. 2013). It is often associated with arid, semi-arid, and sub-humid regions but it occurs in most nations in both dry and humid regions such as Australia, China, India, and the United States (Iglesias et al. 2009, p.4). Since each climate regime has distinctive climate characteristics (i.e., characteristics of drought differ significantly between regions such as the North American Great Plains, Australia, Southern Africa and north-western India), definitions of drought must also be region and application specific (Meze-Hausken 2004, p.5-6, Wilhite 2005). As

acknowledged by Vrba and Salamat (2006)'s definition, drought could thus be defined as a recurrent natural climatic event that occurs in all geographical zones although its characteristics vary significantly from one region to another. In contrast, aridity (low seasonal rainfall) is a persistent condition in a geographic region, which can experience periods of more extreme aridity, or drought.

These definitions are well suited to rural Djibouti and the ASALs of the Horn of Africa where climate is seen as a variable rather than a constant (Segele et al. 2005, Bewket et al. 2007, Jury 2009). However, there is no consensus as to the causes behind the occurrence of drought and aridity periods. Shortage of water may be due to poor rainfall or it may be a consequence of land-use change which increases evapotranspiration and/or reduces infiltration involved in groundwater recharge (Barrow 1987, p.37). In addition, definitions of drought cannot be solely restricted to rainfall behaviour. Apart from the fact that studies on long-term rainfall trends for semiarid East Africa do not give any undisputable proof of recent increased frequency of droughts (Meze-Hausken 2004, Slegers et al. 2008), droughts are not only meteorological but can also develop into agricultural, hydrological or even socio-economic droughts depending on the elements impacted on or under study.

Different types of droughts are recognized in the literature which adds more complexity to its identification. A review of more than 150 published definitions by Wilhite and Glantz (1985) shows that most meteorological drought definitions are based on "degree of dryness" and "duration of the dry period". Meteorological drought relates to the minimum amount of precipitation to be considered as 'normal' rainfall. Some of the thresholds used to distinguish drought from non-drought periods are: less than 2.5 mm of rainfall in forty-eight hours (United States), fifteen days with any one day receiving less than 0.25 mm (Britain), rainfall that is less than 180 mm (Libya), actual seasonal rainfall that is deficient by more than twice the mean deviation (India) or even a period of six days without rain (Wilhite et al. 1985). Agnew and Warren (1996) defined meteorological drought as a period of at least 15 consecutive days without 0.1 mm of rain in any one day while Seleshi and Zanke (2004) defined minimum rainfall as an amount that is greater than one mm. Consequently, the definition of drought is highly context specific but also needs to be nuanced.

Another type of drought found in the literature is agricultural drought. This sort of drought need not coincide with meteorological drought (Wilhite et al. 1985, p.114, Wilhite et al. 1987,

p.16). Agricultural drought definitions link various characteristics of meteorological drought to agricultural impacts focusing, for example, on crop failure (Agnew et al. 1996), departures from normal (Vrba et al. 2006), or meteorological factors such as evapotranspiration or soil moisture availability (Slegers et al. 2008). Also, multiple definitions of hydrologic drought are derived from effects of dry spells (partly due to meteorological droughts) on surface or sub-surface hydrological systems (Wilhite et al. 1985) also termed "flow drought" (decrease in runoff and infiltration). Often out of phase with both meteorological and agricultural droughts, "groundwater drought" lags behind deficient precipitation which makes it a rather subjective and very vague concept often due to lack of long-term data (Wilhite et al. 1985, Vrba et al. 2006). Lastly, we have the socio-economic drought which is intimately related to supply and demand in terms of ecosystem services extraction. In this case, rainfall or groundwater becomes inadequate if human or livestock populations cross a certain maximum threshold or if farming practices are too intensified without investment in efficiency production (Barrow 1987, p.36-37, Agnew et al. 1996, Wilhite 2005, p.9, Taenzler et al. 2008).

Given these difficulties in conceptualizing drought, this research project specifically addressed meteorological drought, climatic variability, changes in rainfall patterns and its effects on rural livelihoods. Since there was no official definition of this hazard in Djibouti, Chapter Six of this research is strictly dedicated to the study of climate variability and drought dynamics specific to Dikhil region in Djibouti. Although this section specifically discusses the concept of drought, a discussion about its occurrence and impacts must include a conversation about desertification as well since these processes often work together (Herrmann et al. 2005).

### 2.2.2 The concept of desertification

The concept of desertification emerged in the 1920s and 1930s in colonial West Africa from concerns about the creeping expansion of the Sahara desert into the Sahel (Herrmann et al. 2005, Slegers et al. 2008). The term was credited to Aubreville in 1949 to describe man's impact on productive land until it changed into desert in the tropical forest zone of Africa. Since then, the term generated much controversy over its actual definition and its political and scientific correctness to describe environmental change and subsequently over the policies and planning projects intended to address environmental degradation (Slegers et al. 2008). The imprecision and lack of clarity about the nature of the problem and the absence of measurable criteria led to confusion over the extent and rate of desertification. The fact that there are over

a hundred definitions of desertification and a variety of assessment methodologies shows how difficult it is to identify it (Verón et al. 2006).

The series of droughts that contributed to famine conditions in several Sahelian countries in the late 1960s ultimately led to the United Nations Conference on Desertification (UNCOD) held in Nairobi in 1977. At that conference, "desertification" was defined as "a reduction of the land production potential in arid, semi-arid and dry sub-humid zones that may ultimately lead to desert-like conditions" (Slegers et al. 2008). This conference launched the desertification issue into the political arena alongside an upsurge in scientific interest and a subsequent debate over the processes involved in the phenomenon. It was generally agreed that the problem was linked to human population growth, overgrazing by livestock and inappropriate land use (Allington et al. 2010).

In response, hazard estimators and indicators of deleterious changes were established where the human side of the equation was emphasized in desertification assessment (Verón et al. 2006). Further, advances in climate observation, monitoring technology and mathematical modelling generated two broad categories of ideas about the linkages between drought and desertification which were internal ecosystem feedback mechanisms on one side and global circulation changes related to patterns of sea-surface temperature (SST) on the other (Herrmann et al. 2005). The lack of any study looking at the drivers of desertification in rural Djibouti compelled the author to incorporate this environmental aspect in the creation of rural vulnerability to drought. It is addressed in depth in Chapter Seven in the context of Djibouti in relation to drivers and impacts linked to rural livelihood change. That being said, the development and increased significance of the desertification concept were also fed by advances in the biological sciences and changes in the understanding of rangeland ecology in the ASALs of the Horn of Africa.

### 2.2.3 Nature in equilibrium versus non-equilibrium

The first half of the 20$^{th}$ Century saw the development of a systems theory, a model of general nature seen as a "black box" with an input and an output and the central notion of stability maintained through linear feedback processes in times of disturbances (Slegers et al. 2008). Until the 1970s, most ecological studies were based on the presumption of nature being in

balance or "equilibrium" where the ecosystem was seen as a self-regulating system which maintained itself through feedback processes throughout the world. As such, the overall system was seen as resilient and able to return to its equilibrium phase after a disturbance. If the disturbance was too severe, the system's adaptive capacity would decrease and become insufficient eventually leading to an ecological crisis manifested through climate change impacts and/or desertification (Gaillard 2010).

Three ideas were derived from the equilibrium paradigm. As described by Slegers and Stroosnijder (2008), the first one is predicated on the "climax vegetation" concept where the equilibrium between climatic factors and prevailing vegetation (i.e. climax vegetation) are disturbed by human interference. Secondly, it was believed that there was a causal link between reduced vegetation cover and decreased rainfall. Thirdly, there was the Malthusian view that the world was finite and could only support a finite population. Many scientists, embracing Malthus' ideas, believed that human mismanagement and overpopulation were the causes behind land degradation. However, there was no consensus on the extent to which human factors were responsible for desertification and the role of climatic factors (Agnew et al. 1996, Herrmann et al. 2005, Slegers et al. 2008).

The danger associated with applying the equilibrium paradigm in the ASALs was the tendency to see environmental change as a move away from equilibrium (and therefore problematic or 'bad') when in fact it may not be. As a result of the predominant belief that sub-Saharan African ecosystems respected equilibrium rules of change up from the 1800s to the 1970s and 1980s, the first explorers in East Africa considered that pasture lands rich in forage were underutilized by rural pastoral groups while bare lands were considered degraded according to standards proper to equilibrium systems found in milder western climates. Concerns expressed by ecologists over imbalances between supply and demand of forage resources led to significant investments in water projects in hitherto underutilized grazing lands, stimulating herd growth and encouraging settled pastoralism and reduced mobility. Consequently, while access to man-made traditional wells were tightly controlled, those that were publicly financed were accessible to all, which in the long run destabilized the natural balance that existed between water access and rangeland use (De Leeuw et al. 1990).

At the turn of the 1990s and up to the present day, it is widely accepted that dryland ecosystems do not follow equilibrium dynamics because it is admitted that rather than livestock numbers

and grazing pressure it was large shifts in abiotic variables (including rainfall) that were seen as the major determining factor impacting the availability of forage, carrying capacity of rangelands and herbivore population growth (Behnke et al. 1992, Fritz et al. 1994, Scoones 1995, Dikman 1998, Schwartz 2005, Vetter 2005, Ayantunde et al. 2011, Oba 2011). Indeed, as put by Vetter (2005), "the equilibrium model stresses the importance of biotic feedbacks between herbivores and their resource, while the non-equilibrium model sees stochastic abiotic factors as the primary drivers of vegetation and livestock dynamics". The non-equilibrium paradigm sees the environment as resilient as it shows resistance to change. Nature is seen in terms of fluxes. It transits among multiple equilibrium points with the presence of irreversible thresholds. This view takes into account the complex reality of social-ecological interactions (Herrmann et al. 2005).

However, if social-ecological interactions are incorporated, does it still mean that thresholds are irreversible? A study by Nyssen et al. (2009) showed that the land reforms of the late 1970s and early 1980s improved vegetation cover in Northern Ethiopia, allowing biomass build up and increased ecosystem functionality. This study and others (Leach et al. 1996) invalidated hypotheses about the irreversibility of land degradation in northern Ethiopia and *a fortiori* in less marginal semi-arid areas. Non-equilibrium thresholds are therefore metastable, dependent on resilience and resistance and in the end, reversible. Several agents of ecosystem change interact including anthropogenic factors, temperature and rainfall changes, atmospheric composition and biogeochemical cycles. This implies that the degradation process itself is complex, not well understood and does not constitute a definite proof for the desertification narrative (Le Houérou 1996, Stroosnijder 2007, Wilcox et al. 2011). This research investigates the social-ecological dynamics part of the production of pastoral vulnerability in the specific context of rural Djibouti. In continuation, the next sub-section discusses the literature about the differentiating elements between environmental change and environmental degradation as a problem.

### 2.2.4 Environmental degradation versus environmental change

There are differences between what is termed "environmental problem" and what constitutes "environmental change" in the drylands. Some studies show catastrophic perspectives on rates of desert advances and areas affected by desertification when in fact the methodology used

does not present evidence for it (Verón et al. 2006). "An environmental problem is concerned with the impact of the environment upon people, and the impacts of people upon the environment" while environmental change targets any change in a "physically monitorable facet of the environment" (Agnew et al. 1996). Therefore, environmental problems are cultural constructs that cannot be divorced from their particular economic and cultural setting which then makes it context specific. It follows that indicators of environmental degradation are features of environmental change while the reverse is not necessarily true and is determined by the social-ecological synergies involved in the preservation of pastoral livelihoods.

The relation between these two concepts (environmental problem versus environmental change) was more assumed than demonstrated because of the paucity of data, confusing definitions, temporal and spatial variability in environmental processes and because of the progressive institutionalization of environmental issues with for instance the United Conference of desertification in 1977. It led to Binns' "people-environment debate" (quoted in Slegers et al. 2008). On one hand, there is the belief that the environment is seen as a victim where land degradation and desertification are due to human actions. On the other, the people are victims of the environment as they suffer from climate change effects and the harsh conditions prevalent in arid and semi-arid environments. As will be seen in Chapter Seven in the drylands of Djibouti, environmental changes were misunderstood and misinterpreted which then led to the implementation of policies which generated environmental problems.

Similarly, the role of politics and institutions in the "invention" of desertification led to a two-sided debate between advocates of different environmental and developmental discourses: the Global Environmental Management (GEM) discourse versus the Populist discourse. The GEM has its philosophical roots in both modernization/stages-of-economic-development theories and Neo-Malthusian thinking whereas the populist discourse finds its inspiration from Marxist and neo-Marxist theory (Herrmann et al. 2005). The term "populist" refers to the positive image given to local peoples' actions while foreign interventions are seen as negative. According to the GEM discourse, overpopulation in the drylands is the main problem. Local land users and farmers are responsible for desertification processes but are also victims embroiled into vicious cycles of poverty and environmental degradation and thus external intervention is necessary to address the problem. From a technocratic worldview, scientists, aid bureaucrats and national civil servants are depicted as heroes who come up with solutions to environmental problems.

In contrast, the populist discourse sees global capitalism, transnational corporations and northern consumers as "bad" whose interventions are to blame for marginalizing smallholders and pastoralists eventually leading to land degradation and exploitation (Herrmann and Hutchinson, 2005, Slegers and Stroosnijder, 2008). Nowadays, the GEM discourse, reinforced by the institutionalization of the desertification debate (UNCOD in 1977, the Plan of Action to Combat desertification (PACD) and the United Nations Conference on Environment and Development (UNCED) in 1992) and cultural and economic globalization processes, still dominates although insights from the populist discourse are more taken into account (Herrmann et al. 2005). The study of historical and contemporary processes at work in the Republic of Djibouti in defining rural vulnerability to drought intends to shed some light on the social-environmental mechanisms behind land degradation and desertification.

## 2.3 The concept of vulnerability in the literature

### 2.3.1 The challenge in defining vulnerability

To link vulnerability analysis adequately to decision-making it is important to have an appropriate understanding of the concept (Turner et al. 2003). Kofi Annan, the seventh Secretary-General of the United Nations, acknowledged that "the ability to assess vulnerability is increasingly seen as key to reduce risk as opposed to purely hazard research in the past" (Birkmann 2006, p.9). The theoretical significance of the concept of vulnerability needs to be more acknowledged nowadays as it helps clarify the concepts of risk and disaster (Cardona, 2004b quoted in Birkmann 2006, p.12). This is partly reflected in the recognition that the interconnectedness that characterizes the relationship between the natural environment and human populations in rural areas is intimately tied in with the vulnerability of rural livelihoods. As such, "different social systems will respond [differently] to this vulnerability" (Fraser et al. 2003). Therefore, when it comes to vulnerability assessment, analysts need to fuse social and environmental data within a single analytic framework.

Fraser (2003) mentions two challenges that must be dealt with. Firstly, scholars must find "the middle-ground between the overly simplistic and the overly complex" in order to easily and concretely apply the theory in the field. In this respect, an acceptable framework would first

need to tackle the most important factors of vulnerability in a systemic way which would be accessible to actors (academics and policy-makers alike) from different backgrounds. Second, scale must be appropriately defined as it determines the extracted results and the interpretation and application of findings (Fekete et al. 2010, Kienberger et al. 2013). This point stems directly from the nature of vulnerability discussed in the next paragraph. Conflicting views over the meaning of vulnerability are linked to the paradigm shift of the early 1980s from the realist perspective (where risk was seen as quantifiable and assessable by engineers, geologists and geographers) to the social constructivist or social construction of risk. As Cardona (2004, p.46) puts it, there is now a need to "transcend the epistemological antagonism between 'objectivism/positivist' and 'subjectivist/constructivist' paradigms and rely as much upon qualitative as quantitative methods for risk conceptualization and estimation". This research gap is addressed in this research where both social and environmental variables on one side, and qualitative and quantitative data on the other are used to propose a social-environmental explanation of vulnerability to drought in Djibouti.

According to Hilhorst and Bankoff (2004), vulnerability is the manifestation of a combination of social and economic conditions in the face of a hazard. As they state it, vulnerability is "part of a dynamic, evolutionary and accretive process". It is temporally and spatially dynamic (Hilhorst et al. 2004, p.2) while differentially affecting people (Downing et al. 2005, p.3). Referring to the "concomitance and mutual conditioning" of hazard and vulnerability, Cardona (2004) talks about the mathematical concept of "convolution" that characterizes vulnerable populations. According to him, as opposed to the hazard, "global vulnerability" is a condition that is created or produced, builds up and is maintained through time (and space) and is a function of both social components and "the level of development" of these populations. When hazards combine with factors of vulnerability, risk materializes as disasters which then hold back development and at the same time are "rooted" in development failures (Cardona 2004, p.39) and development "aggression" (Heijmans 2004, p.125). This is exemplified by the large proportion of aid money often absorbed by disaster foreign assistance that should be devoted to sustainable development overseas (Wisner 2003, p.48).

These extreme events pressure or "stretch" communities' coping capacities until livelihoods are severely affected on the short and long term. Not only are populations rendered more vulnerable, but the sustainability of these livelihoods is undermined to the point of destitution (White et al. 2004, p.2-3). Along the same lines, Cardona (2004, p.49) states that degradation,

poverty and disasters are the "expressions of environmental problems [while] their materialization is the result of social construction of risk brought about by the construction of vulnerability or hazard or both". However, important distinctions must be made between poverty and vulnerability. The existing linkages between the two do not mean that development which reduces poverty necessarily addresses vulnerability. In sum, poverty is different from vulnerability but highly correlated (Alwang et al. 2001, p.49, Ellis 2003, Cardona 2004, White et al. 2004, p.5, Villagrán 2006).

There is no general consensus on definitions, terminology, policy relevant indicators or indices. As a result, there is no consensus on how to measure the components of vulnerability (Downing et al. 2005, p.2, Gallopín 2006, Villagrán 2006). Consequently, agencies use the concept in a way that befits their agenda and practice which, in most cases, means focusing on physical and economic vulnerability (Heijmans 2004, p.115-116). In the same vein, the literature on vulnerability exhibits an astonishing number of conflicting conceptual frameworks and unconsolidated data (McLaughlin et al. 2008) which, contrary to the views of Costa and Kropp (2013)'s, can determine the scale of vulnerability assessment methodologies which in turn can influence the type of policy and interventions implemented in the field, the nature of target groups and future vulnerability scenarios (Birkmann et al. 2013b). According to Füssel (2007a), the reasons for such confusion over vulnerability's definition lie in the failure to differentiate in the "sphere (or scale)" between the internal (endogenous) and external (exogenous) characteristics of system vulnerability on one hand, and the "knowledge domain" between socioeconomic vulnerability (in relation to economic resources, social aspects of a population including culture and power relations) and biophysical vulnerability (as appreciated by the physical sciences) on the other. There is therefore an issue with the geographical scale of analysis and another with the type of vulnerability that is looked at.

As mentioned earlier, disaster is commonly seen as the "realisation of hazard", or, as it is interpreted for this study, a 'materialization' of risk because of the social implications of vulnerability (Smith 2001, p.7). Before discussing the empirical relevance of vulnerability in the disaster risk equation and different frameworks proposed in the literature to assess it, different schools of thought that looked at the concept from their respective perspectives are presented.

### 2.3.2 Different geographical schools of thought about vulnerability

The disaster literature indicates that there is a long history of vulnerability research from different perspectives, from social geography to constructivists approaches to political ecology (Füssel et al. 2006). This sub-section first contrasts the behavioural paradigm with the structural paradigm in the policy arena. The literature on understandings of vulnerability is then reviewed through the lens of five geographical schools of thought that McLaughlin and Dietz (2008) designate as: the biophysical perspective, the human ecological perspective, the political economy perspective, the constructivist perspective and the political ecology perspective[3]. The different definitions of vulnerability as well as their connection to other concepts such as risk, hazard, coping capacity, exposure and resilience are discussed in the following sub-section on the conceptualization of vulnerability.

The first major current that predominated between the 1930s and the 1990s is commonly referred to as the behavioural paradigm in hazard and risk research. This paradigm defended the scientific understanding of geophysical processes causing disasters. This view was also reflected in risk assessments where despite the recognition of the importance of human perception and behaviour, it mainly deplored physical and managerial control as an explanation for damaging events (Hewitt 1983, Smith 2001, p.49-50). Criticized for being non-political, behaviourists were mainly interested in understanding the responses of individuals and groups in the context of disasters (Pelling 2003, p.9). Consequently, the efforts of its proponents were directed toward emergency response and the development and implementation of disaster plans. While still being the dominant view of some governments (Smith 2001), this line of thinking was deemed heavily ethnocentric as inhabitants of hazard stricken regions were seen as incapable of removing themselves from danger (Wisner 2003). Moreover, it was "rooted in materialism" and unable to account for social structures in shaping vulnerability. Given the social-environmental nature of this research and the significance given to the social drivers of vulnerability, the behavioural paradigm was therefore deemed not adapted for this study.

In the following year, a counter-current emerged, namely the structural paradigm. By 'structural', it meant that its proponents acknowledge the role of institutional processes in

[3] A discussion of the concept of vulnerability in economics, sociology and anthropology can be found in Alwang et al., 2001.

determining the constraints and opportunities imposed upon individual action. As such, this paradigm is less hazard-specific and is more integrative than the behavioural perspective. As supporters of this way of thinking, the neo-Marxists of the 1990s managed to put forward the importance of preparedness, the political dimension in which it takes place and the social structures that shape environmental risk (Pelling 2003, p.9). This inclusion of socio-political elements means that environmental disasters are not seen as being mainly and merely caused by physical processes. For instance, it is believed that growing poverty in the least developing countries led to greater vulnerability and exposure to various hazards. "Structuralists" therefore reject the "extra-ordinary" nature of disasters as assumed by the behavioural paradigm and rather viewed factors such as "underdevelopment", a dynamic process of "third world impoverishment perpetuated by technological dependency" and unequal terms of trade between the 'South' and the 'North', as important elements determining vulnerability to hazards (Smith 2001, p.50-52). The weakness of this viewpoint is that the study of the socio-political structures involved in shaping environmental risk are not addressed in an immanent way and therefore cannot really account for internal socio-ecological changes linked to the production of vulnerability.

This perception change of vulnerability in the policy arena was also reflected in the theoretical arena albeit not as clear-cut. The biophysical perspective (similarly to the behavioural paradigm) emphasized the centrality of environmental variability. Dominant in vulnerability research to climate change and other hazards, this school of thought eulogized the 'measurable', the 'assessable', the 'quantifiable'. According to this approach, the first step in understanding and appreciating vulnerability was to quantify these biophysical factors before anything else (McLaughlin et al. 2008). However, it is contended in this study that such a narrow-minded view of the dimension of vulnerability misses the social, economic and political aspects of the disaster equation. As remarked by other authors (Cutter 1996, Wisner et al. 2004, McLaughlin et al. 2008), it does not (and cannot) address the variety of livelihood strategies and the preference for certain coping strategies over others to mitigate exposure and impacts from environmental hazards. Moreover, there was no standard approach for combining socio-economic and biophysical approaches and therefore there was difficulty in accounting for the dynamism of vulnerability (Alwang et al. 2001).

The human ecological perspective emerged out of dissatisfaction from geographers about the ineffectiveness of the US flood control policies of the 1920s and 1930s (Pelling 2001, Pulwarty

and Riebsame, 1997 quoted in McLaughlin et al. 2008). It criticized development theories as eurocentric and raised the need to focus on the adaptation strategies of the communities experiencing the risk. This perspective viewed environmental change as a driver of social change and vulnerability. "Human systems are embedded within ecological processes" and as such, society must adjust to control Nature. Subsequently, there was a gradual shift away from White's (1949, quoted in McLaughlin et al. 2008) "evolutionary theory" towards Steward's (1955, quoted in McLaughlin et al. 2008) "multilinear cultural ecology". These changes revealed the complexity and the unpredictable nature of interactions that link human systems to wider environmental changes which were also reflected in the dynamism and multi-scalar nature of vulnerability. Although this essentialist theory did not reject history, it failed to account for the diversity of "actual histories" and therefore failed to explain the different determining factors behind the homeostasis of these (human and ecological) systems. In particular, it failed to explain the social-environmental processes that make the overall system sustainable and therefore its proponents tended to directly jump into the study of human-ecological interactions in times of crises[4]. Human ecologists and political economists share common ground in that they emphasize the changing nature of social structures behind the dynamism of vulnerability. The background research sub-questions require this study to trace back the forces of social-environmental change and therefore needs to examine the nature of the social-environmental status quo in pre-colonial time as the analytical starting point. In this regard, it seems that the human-ecological perspective is vague, lacks precision and fails to outline an analytical methodology that could be applied to this study.

In political economy, the earliest attempts at defining social-ecological vulnerability date back to Marx's theory about the "motion of capitalism" as a factor behind the impoverishment of the exploited communities, commonly attached to the term "metabolic rift" (McLaughlin et al. 2008). According to him, "the mode of production of material life conditions the social, political and intellectual life process in general". Under the capitalist mode of production, the full value of what working people make could not return: thus there was exploitation (Clarke 2006, p.112). Furthermore, as remarked by McLaughlin and Dietz (2008), while "surplus value" was engulfed by the industry, "short-term profits" for large-scale agriculture led to overexploitation of the soil and a decrease in soil quality. Building on Marx's view,

[4] In response to such criticism, a "revised ecological paradigm" now focuses more on understanding the adaptation of communities through time as it is visible, for instance, in the food security literature (Ellis, 2003).

vulnerability was therefore, above all, a "class phenomenon" (Pelling 2003). More recently, political economy emerged in several works in different fields as an attempt to better explain the origin and role of class as a driver of differential vulnerability. This was best reflected in the works of Watts (1983) and O'Brien (1985, quoted in McLaughlin et al. 2008) on the explanation of food shortage and famine in Africa where the political economy perspective was put forward. Social structures, rather than natural forces, technology, or human agency were behind the production of vulnerability (Füssel 2007a). In a sense, it seems that this approach is opposite to the biophysical perspective which explicitly focused on environmental determinants of vulnerability.

Another seminal and more focused contribution came from Sen's entitlement approach which advocated the need to focus on the factors of access to sufficient food rather than determinants of aggregate decline of food supply. As a matter of fact, Sen's perspective on food entitlements was incorporated in Blaikie et al.(1994, p.88-92) and Wisner et al.(Wisner et al. 2004, p.89)'s access model. The latter is introduced and discussed in more detail in the following section. There are three main criticisms of this school of thought. Firstly, the natural side of the problem is neglected as environment based factors (hazard and natural resource base) were taken as exogenous (Alwang et al. 2001) to the system under study. Secondly, it did not propose "systematic theories of 'obstacles' to account for 'deviations' from predicted 'natural' paths of change" which led to digressions between theory and history (see in McLaughlin et al. 2008). Basically, lack of understanding of the social-environmental system apart from potential exogenous shocks did not allow for an adequate comprehension of vulnerability systems. Thirdly, policy-wise, it was very hard to apply any of the insights in practice as it was to essentialist in nature (Bohle et al. 1994) and therefore did not hint at possible applicable answers to crises.

Constructivists acknowledged the negotiation of social conventions (non-permanent) and contestation of spaces in time and within historical contexts (Watts 2000). They underlined the cultural shaping of exposure to risk through, for example, gender, social class or beliefs which was the main weakness of the human ecological perspective. Stallings (1997, quoted in Wisner et al. 2004, p.18-19) further divided the school along a "realist-weak constructionist-strong constructionist" continuum. The realist approach takes risk as a hazard that can be objectively measured (scientifically and statistically) "independently of social and cultural processes". The weak constructionist approach also views risk as an objective hazard but in this case, it is

"mediated through social and cultural processes". Lastly the strong constructionist approach does not recognize risk as its existence or 'making' is directly contingent upon "historically, socially and politically created 'ways of seeing'" (Lupton, 1999, p.35 quoted in Wisner et al. 2004, p.19). In a nutshell, the constructivist way of thinking postulates that 'normal' pressures in global, regional and national systems of economic, social and political power contribute in reinforcing existing vulnerability to natural hazards. Although constructivists succeed where human ecology and political economy fail, this school of thought does not adequately account for the dynamics and immanent specificities of social structure. Its "nominalist" nature arbitrarily categorizes social life which confuses the boundary between epistemology and ontology and "mistakenly equates the perception of reality with reality itself" (McLaughlin et al. 2008). Finally, although the vital linkages between the social and the natural are present, the biophysical elements are "subsumed" into history which deprives it of its natural and independent causal aspect (Oliver-Smith 2004).

The last school of thought which deals with various aspects relevant to this research is the political ecology approach. It arose from the political economy school of thought in the late 1970s as an attempt to subsume the "cultural/human ecology dimension" within political economy (McLaughlin et al. 2008, Cutter et al. 2009). More simply put, it focuses on questions of access and control over resources in trying to understand and explain the processes of environmental disturbance and degradation. The kernel of this school of thought resides in its ability to marry and integrate human as well as physical approaches through a theoretical proposition capable of addressing ecological crises (Watts et al. 2004, p.6-7). It therefore emphasizes the social relations that shape resource management and poverty (nature-society relationship) (Downing et al. 2003) through the double nexus of production and consumption (Birkmann, 2006, p.47). More recently, there was a turning point from conventional Neo-Marxian assumptions with the development of an "anti-essentialist political ecology", also called "post-structural political ecology" (Escobar 1996, Nightingale 2006). This draws upon the constructivist approach where a multiplicity of "social and biological worlds" is recognized.

Unfortunately, as Vandergeest et al.(1999, p.574 quoted in McLaughlin et al. 2008) argues, political ecology is an open arena for interdisciplinary discussion rather than a formal and homogenous school of thought. Yet, (post-structural) political ecology is the only vital theoretical approach which is capable of yielding useful social-environmental response elements to the problematic studied. More precisely, this research intends to deliver an

understanding of social-environmental processes with a post-structural political ecological outlook at the problematic of rural vulnerability to drought in Djibouti.

### 2.3.3 Analytical frameworks for the study of vulnerability to hazards

In this section, four ways to model the concept of vulnerability to natural hazards are discussed. Differences in meaning and perception of vulnerability often determine analytical frameworks used in vulnerability assessments. Each one of these perceptions is criticised before suggesting the model suited for this particular study.

- *Food security and Livelihood community*

Since the 1970s (and especially during the 1990s), authors and practitioners concerned with vulnerability in relation to food security and famine tried to define and devise ways to measure it. The fundamental question that needed asking was what are people vulnerable to (Blaikie et al. 1994). In the late 1980s/early 1990s, research on vulnerability led to a separation between the disaster management community and the food security community because of an analytical divergence in vulnerability assessment methods (Dilley et al. 2001). The latter regarded the concept of vulnerability in relation to an outcome (food security, famine) while the former advocated the fact that vulnerability had to be seen in relation to hazards (drought, floods).

In the famine and food security literature, Sen's contribution to the theoretical understanding of how famines unfold from entitlement failure (and not just aggregate decline in food availability) led to the birth of various assessment methods. In defining vulnerability with regards to an outcome, a new definition was propounded by Downing (1991, p.5 quoted in Dilley et al. 2001) where "vulnerability refers to a consequence, rather than a cause". Vulnerability was not seen in relation to hazards or shocks but to outcomes. Also, the concepts of "risk", "hazard", and "vulnerability" were combined together in the most cited definition of vulnerability in the food security literature. That definition is Chambers' and reads as follows: "Vulnerability here refers to exposure to contingencies and stress, and difficulty in coping with them. Vulnerability thus as two sides: an external side of risks, shocks and stress to which an individual or household is subjected, and an internal side which is defencelessness, meaning a lack of means to cope without damaging loss" (1989, p.1 Bohle et al. 1994, Dilley et al. 2001,

Yaro 2004). This definition of vulnerability denotes both exposure and sensitivity but without equating it with the notion of poverty.

Bridging with the livelihood literature, food security scholars identify two sides in the coping capacities of households. Firstly, there is the *ex ante* anticipation (or risk management) which corresponds to accumulating/securing assets to "buffer" impacts in times of extreme conditions and diversifying income sources (e.g. off-farming). The other side is *ex post* coping which involves "non-erosive responses" (rationing, wild-food gathering) and "erosive responses" (selling of assets) (Ellis 2003). These actions contribute to reducing the risk of food insecurity. For this research, the problem here is that the condition of vulnerability is seen as static. The post-structural view of this thesis rather considers vulnerability as being constantly changing, dynamic and fluid. In order to propose an explanation of vulnerability to a hazard, a multiplicity of factors shaping day-to-day vulnerability levels to external shocks needs to be taken into account.

Bohle et al. (1994) stress that the causal nature of vulnerability to hunger and food insecurity is determined by three variables, namely, "human ecology", "expanded entitlements" and "political economy", which are also seen as the three elements delimiting the social space of vulnerability. These authors view climate change as directly influencing human ecology and "resource endowments" (e.g. crop yields, soil fertility in the case of agriculture in the arid/semi-arid tropics). Indirect effects are harder to predict. In parallel, they acknowledge the underlying "drivers of global change" such as population growth, economic growth and political transitions as affecting resource endowment, entitlement and the political economy (Bohle et al. 1994, Villagrán 2006). With the double-structure of vulnerability, the internal side on one hand (coping and response capacity) and the external side (exposure to risk) on the other, this framework views exposure not merely as spatial exposure, but more of a concept inherent to vulnerability that comprises features related to both Sen's entitlement theory and the human ecology perspective (Cutter 1996, Bohle 2001, Birkmann 2006, p.19, Villagrán 2006, p.14). This view seems to correspond to the social-environmental endeavour behind the study of rural vulnerability to drought in Djibouti.

However the problem with this view is that vulnerability tends to be equated to exposure without including varying levels of susceptibility to a hazard. The author contends that differential degrees of vulnerability of two communities to a hazard with equal *exposure* levels

may be missed because of possible differences in their *susceptibility*. Interestingly, livelihood and food security scholars progressively changed their viewpoint over time. For instance, Ellis (2003) stated that risk of food shortage needed to be seen as a function of vulnerability to a hazard on one hand (internal cause) and the hazard on the other (external cause). In a similar way, the Global Environmental Change and Food Systems (GECAFS) project within the Earth System Science Partnership sought to conceptualize the issue of food security by "coupling concepts of food security and social vulnerability". They commend this social and broader view of "food vulnerability" and now seem to see vulnerability in relation to stresses (global environmental change as a hazard) and societal changes rather than to outcomes (Exner et al. 2008, p.128)[5].

Another framework proposed prior to the aforementioned perception change about vulnerability is Bohle (2001)'s double structure of vulnerability. This double-structure, developed from Chambers' insightful definition, is equivalent to the way "risk" is used in disaster risk studies. One confusing aspect is that the concept of "risk" in the food security literature is equivalent to the concept of a "hazard" in the disaster risk studies community (Dilley et al. 2001). This research rather advocates that a hazard must be first studied separately from factors of vulnerability. Afterwards, the understanding of these two separate functions of the disaster risk equation must be coupled with a specific look at their intersection: disaster risk. Moreover, the fact that the internal side of vulnerability is characterized by "absolute defencelessness" means that there are no degrees of susceptibility within a same household. Analysts need to select relevant criteria for both exposure and susceptibility in the identification of relevant groups vulnerable to a particular hazard. Similarly, Dilley and Boudreau (2001, p.12) observed that in order for food vulnerability scholars to describe the impact of "macro-level" processes on food security, there is a need to "disaggregate general hazard impacts into proximate and specific shock factors or causes". In the context of this present study, food insecurity is seen as an outcome or risk that is contingent upon or a function of hazard(s) on one side, and vulnerability on the other.

[5] This section of the UNU-EHS report was written by Bohle himself which shows that his view of vulnerability in relation to hazards (as stresses and shocks) versus outcomes (food insecurity, famine or disease) may have changed over time. Today, his perspective seems to convey a concept of vulnerability very similar to disaster risk studies' perspective.

- *Climate change community*

One early article by Downing (1991) focusing on vulnerability to hunger from a climate change perspective highlighted the non-randomness of famine as it is related to a variety of environmental, social as well as economic factors impacting the production of hunger at different intensities and "different geographic and social scales". According to him, vulnerability is an "epidemiological concept" which is similar to "comparative statistics" in economics and "risk mapping" in disaster risk studies. Bearing in mind that Downing also contributed to the understanding of the concept in the food security literature (Bohle et al. 1994), he enunciated three characteristics of vulnerability in relation to hunger. As he puts it, firstly, it refers to a consequence (e.g. famine) rather than a cause (e.g. drought). Secondly, in contrast to the neutral aspect of sensitivity, "vulnerability implies an adverse consequence" as there is a comparison made between the sensitivity of maize yields to drought versus the vulnerability of households to hunger. Thirdly, he views vulnerability as a relative term that differs among the communities at risk, rather than an "absolute measurement of deprivation".

Over the last decade, Smit and Wandel (2006) and Soares et al.(2012) described the emergence of a common conceptual view about vulnerability as a function of exposure and sensitivity of the system to a hazardous condition and the ability or capacity to cope, adapt, and recover (Aven 2011). A system that is more adaptive (higher or better adaptive capacity) is less vulnerable (Downing, 2001, quoted in Adger 2006, Smit et al. 2006). Here, as opposed to Chambers' idea of a static internal side of vulnerability as being "absolute defencelessness" in the face of an outcome, vulnerability is dynamic and variable "in time, space, by stimulus and by system" (Smit et al. 2006). Here, adaptation refers to "a process, action or outcome in a system [...] for it to better cope, manage or adjust to some changing condition, stress, hazard, risk or opportunity". The forces reinforcing the adaptability of a system are the reflection of its adaptive capacity: adaptation is the manifestation of adaptive capacity. Although this view sounds compelling for this study, it is unclear whether the system is vulnerable to a "hazard" or to a negative or "unsafe" outcome caused by a hazard. Again, similarly to the livelihood and food security perspective, this uncertainty leads back to the debate on the conceptualization of vulnerability in relation to an outcome or a hazard.

Interestingly, Füssel (2004, quoted in Füssel 2007b) described the assessment of vulnerability as dependent on the characteristics of the vulnerable "system", the type and number of

"stressors" and their "root causes", their "effects" on the system and the "time horizon" of the assessment[6]. He proposes a general framework for climate change research that is based on six dimensions: the temporal reference (current versus future versus dynamic), the sphere (internal versus external versus cross-scale), the knowledge domain (socioeconomic versus biophysical versus integrated), the vulnerable system, the attribute of concern and the hazard (Füssel 2007a). However, this model, although relevant and very comprehensive, is too complicated to be used in the context of this study. Further, it is thought that this model would not account for vulnerability factors specific to and hidden within the workings of a rural pastoral environment (Blaikie et al. 1994, Wisner et al. 2004).

Another effort to come up with a formal and homogenized framework for the study of vulnerability to climate change is exemplified by Ionescu (2009)'s mathematical model. In opposition to Smit and Wandel's claim, Ionescu et al. stated that there is "confusion regarding the notion of 'vulnerability' in the climate change scientific community". He cites the Third Assessment Report of the Intergovernmental Panel on climate change (IPCC)'s definition which sees vulnerability as "a function of the character, magnitude and rate of climate variation to which a system is exposed, its sensitivity and its adaptive capacity" (IPCC 2001). In response to this lack of consensus, they proposed a model inspired from the Oxford Dictionary of English's definition of vulnerability. It refers to exposition to the "possibility of being attacked or harmed, either physically or emotionally". Through a grammatical investigation of the use of the term, they categorize negative outcomes due to hazards ("stimuli") and improved conditions from vulnerability reduction measures (coping capacity) and set up "preference criteria" that refer to future evolutions of the "entity" under study. The three primitives (entity that is vulnerable, stimulus, and the nature of the outcome as positive or negative) help to mathematically translate the grammar.

The main advantage of this model is that through mathematics, independently of one's field, school of thought or approach, the results would be meaningful across disciplines. However, the author argues that it does not solve the differences in conceptualization of the notion of vulnerability. Here again, vulnerability is seen as corresponding to exposure. The danger behind such conceptualization of vulnerability in disaster risk studies and policy-making is in

[6] The words in quotes (except time horizon) are exactly the same as those used to conceptualize vulnerability in Blaikie et al., 1994 and Wisner et al., 2004. It is an example that shows the use of common terms with meanings differing across scholarly community perspectives.

identifying common vulnerability patterns in a community that actually hides differential levels of susceptibility to a hazard. In return, 'blanket' policies or responses that are applied to lower the degree of vulnerability of a community towards a hazard might, on the contrary, exacerbate particular households' vulnerability levels. Also, a mathematical translation of qualitative information would not account for nuances, variations in definitions and idiosyncrasies in space and time. Finally, its use and application in other disciplines unfamiliar with its mathematical language could also be a challenge (Ionescu et al. 2009).

- *Global environmental change community*

Within the global environmental change community (GEC), vulnerability is characterized by sensitivity to or exposure of a system (people or place) to shocks, stresses or disturbances (Costa et al. 2013). It is evaluated in relation to a threshold of damage and the system's ability to withstand strong changing conditions (Luers 2005, Miller et al. 2010, Fraser et al. 2011). This can be contrasted with the food security literature where vulnerability was believed to relate to consequences of a perturbation rather than to its agent. As seen earlier, the food security community views human individuals as vulnerable to loss of life, livelihood and assets or income rather than to the specific agents of disaster (Singh et al. 2002, p.13). Another aspect to mention is the fact that vulnerability is regarded as a social phenomenon. Consequently, the GEC eulogizes integrative frameworks that account for both the social and the ecological/environmental dimensions. Both aspects in addition to the processes of change influencing them determine the level of vulnerability (in terms of sensitivity and exposure) to shocks or stresses (Costa et al. 2013).

There are four main GEC frameworks that were postulated in trying to conceptualize vulnerability in relation to sources of and impacts from environmental change. The first framework (and the most cited in the literature) is Turner et al.'s sustainability framework. This model defines vulnerability as the "degree of likelihood to experience harm due to exposure to a hazard, [...] a perturbation or [a] stress/stressor" (Turner et al. 2003, p.1). Broad in nature, it places local vulnerability in relation to processes operating at regional and global scales in a way that may be too theoretical to be reified (Cutter et al. 2009). The scale of analysis being the "human-environment" system, hazards impacting the system develop from outside and inside the system (and place) which invites users to always contextualize the framework according to place-based forces of change. The dynamic conditions of the system include the

"social and biophysical capitals" which determine possible coping mechanisms. These coping mechanisms are then evidenced and exposed by the impacts from exposure. These mechanisms also change and are relied upon to 'buffer' the said impacts (Turner et al. 2003). In a nutshell, vulnerability in this context "rests in a multifaceted coupled system with connections operating at different spatiotemporal scales [and] commonly involving stochastic and non-linear processes" (Turner et al. 2003). Although the model is relevant and quite integrative (and accounts for the multi-scalar nature of vulnerability), it does not visibly distinguish between exposure and sensitivity and does not noticeably indicate "where vulnerability begins and ends" (Cutter et al. 2009). It is thus hardly useful for empirically based analyses like the present study and is more directed towards qualitative evaluations. Further, there is no clear and appropriate distinction between drivers and consequences in "feedback-loop" mechanisms (Birkmann 2006, p.27).

Another framework inspired from the previous sustainability framework was recently propounded in Birkmann et al. (2013a)'s paper integrating exposure, susceptibility, lack of resilience and the multifaced nature of vulnerability (physical, social, ecological, economic, cultural and institutional). Bearing in mind that its proponents do not really belong to the GEC community, their MOVE framework is a novel heuristical and analytical tool in assessing the vulnerability at various scales in the context of natural hazards, climate change and environmental change. As they try to conceptually bridge the disaster risk studies perspective with the climate change community perspective, the MOVE framework is more of an operational tool than a model suited for long-term study of the progressive establishment of vulnerability factors. Although they do recognize the dynamic nature of vulnerability both spatially and temporally, the framework does not clearly show the role of underlying forces of change determining the availability of and access to resources. Since this research assumes that there are historically remote root causes that participated in the creation of current rural vulnerability to drought, the MOVE framework, although holistic and useful policy-wise and for short-term analysis, cannot be applied for this study.

The third major framework is the socio-ecological system (SES) which conceptualizes vulnerability in a similar way but with some slight differences. Like the previous vulnerability frameworks of coupled human-environment systems, SES visualizes systems in relation to both "societal (human) and ecological (biophysical) subsystems" interacting at various scales (Gallopín 2006). The model acknowledges both the internal (endogenous) and external

(exogenous) nature of "perturbations" (hazard or stressor) which echoes Bohle's double-structure in the causality of hunger (Bohle 2001). Gallopín (2006) bears in mind that this nature of the hazard or disturbance (internal or external) depends heavily on the scale at which the system is analysed (White et al. 2004, p.22), meaning that some perturbances (earthquakes, hurricanes or global economic changes) may be internal to one system (for the global SES) and external at the same time (for a local village or community).

Similarly to the sustainability and MOVE frameworks, the SES views a system that is resilient in relation to the response component of vulnerability. Contrarily to what is believed by some proponents of the resilience approach to vulnerability definition, resilience is not seen as separate from vulnerability (Gall 2013) but rather as interlinked (Füssel et al. 2006, Gallopín 2006, Sapountzaki 2012, Birkmann et al. 2013a). Adaptation is a characteristic of the system (as commonly seen accross most schools of thought and disciplines). It is the capacity of a social-ecological system to cope with "environmental contingencies" and the capacity to improve its state in concert with its environment. Although this framework does share some of the premises required for this study including the social-environmental outlook on pastoral systems, it cannot be used for an understanding of the mechanims involved in creating vulnerability of *people* to hazards. Here, although there will be some reference to pastoral systems in general and how they operate and are sustainable in the ASALs of the Horn of Africa, the main focus of this study is on identifiying the historical accumulation of factors of vulnerability of pastoralists themselves rather than the sustainability and/or vulnerability of the complex system within which they are embedded.

The surface of vulnerability framework is the fourth and last GEC framework. Its originality lies in the way it aims at homogenizing vulnerability conceptualisation within the GE discipline. Like the sustainability system, SES and MOVE approaches, it does acknowlege the social-ecological nature of interactions with the sensitivity and exposure of a system to "changing conditions" seen as exogenous, while forces such as poor land-management practices are endogenous causes of heightened vulnerability (Chambers, 1989, quoted in Bohle et al. 1994, Turner et al. 2003, Luers 2005). Its peculiarity is that the surface of vulnerability is described as a three-dimensional plane with vulnerability being "proportional to sensitivity and exposure but inversely proportional to the state of the system relative to a (dynamic) threshold of damage". However, this standardization method does not aim at explaining vulnerability,

and translating its conceptual findings into policy or management would be too difficult (Luers 2005, Eakin et al. 2006).

In general, these frameworks exhibit humans as part of a larger "global system" with linkages between people and places that are strenghtened through large scale processes of GEC and globalization (connectivity dimension of human security). As such, human security is intimately related to the state of the biosphere, atmosphere, cryosphere and oceans and across space and time (O'Brien et al. 2008, p.6). Consequently, efforts and programmes aimed at addressing vulnerability of the poor must impact various sectors and "spheres" in which people are engaged (not only agriculture). However, because of their complexity, short-term insights and the lack of focus on pastoralists per se and how they relate to their surrounding social-environmental context, none of these GEC framewords are really suited for conducting this study.

- *Disaster risk studies community*

More than for the other three disciplines, there is a strong consensus in the disaster risk studies community that people's vulnerability is generated by social, economic and political processes which influence how hazards affect people in varying ways and with different intensities (Blaikie et al. 1994, p.3-5, Lindsay 2003, p.4-5, Taubenböck et al. 2008). Hazards are seen as integral to human-environment interactions which means that disasters can arise from "injustices, deprivation or inequalities of 'normal' life" (Mustafa 2003). Vulnerability is viewed as a function of exposure (where and how people work) and susceptibility to harm (social, economic, psychological, and environmental) which determine differential impacts from hazards. As seen earlier, this aspect of the vulnerability concept was missing in both the livelihoods and food security and climate change communities' perspectives.

Vulnerability is sometimes referred to the capacity to anticipate, cope with, resist and recover from hazard impacts and contrasted with resilience (Cannon et al. 2003, White et al. 2004, p.22-23). Further, there is a recognition of the role of underdevelopment in the historical accumulation of factors of vulnerability which tend to be suddenly exposed in times of disaster (O'Keefe et al. 1976, Villagrán 2006). This vision of vulnerability is commensurate with the objectives of this research. Terminology wise, 'risk' is viewed as the "probability of loss of a certain element" whereas a 'hazard' has "the potential to cause negative consequences". The

implications of this are two-fold. Firstly, a natural phenomenon is termed a hazard in hypothetical terms when considering scenarios where they affect the elements under study. Secondly, it is recognized as a 'risk' only when it has the potential (likelihood or probability) of affecting people and/or the livelihoods they depend on.

The 'hazard' has two components, namely, magnitude and duration and corresponds to a complex chain of processes and impacts that can lead to disaster (Smith 2001, p.18). 'Disaster' is seen as the actualisation of negative impacts because of the occurrence of a certain hazard and its interference with vulnerable elements (Schneiderbauer et al. 2004, p.9-10). With regards to resilience, there is still some debate as to its inclusion within the concept of vulnerability (Gaillard 2010, Fekete et al. 2014). In effect, on one hand resilience can be seen as an integral part of adaptive capacity (Birkmann et al. 2013a) while others view adaptive capacity as a major component of vulnerability without necessarily referring to resilience (Cutter et al. 2008a). For this research, adaptive capacity is considered as an integral part of the concept of vulnerability at both the household and community level since it encloses the capacity for the affected people to 'buffer' impacts and recover from them. This vision of adaptive capacity might be similar to that of resilience. However, the latter term is usually employed in the literature for social-ecological systems' sustainability or at the societal level rather than for households' ability to recover (Miller et al. 2010, Sapountzaki 2012, Birkmann et al. 2013a, Costa et al. 2013, Gall 2013, Fekete et al. 2014).

The use of the concept of 'vulnerability' has evolved within disaster risk studies. Briefly outlined here, Wisner (2001) identifies four clusters of approaches to (social) vulnerability. The first cluster relates to the UN Disaster Relief Organisation (UNDRO)'s 1979 definition where the "potential for damage or loss" corresponds to disaster risk. It is seen as a function of the hazard and vulnerability (R = H x V)[7] (Schneiderbauer et al. 2004). There was a need to refocus vulnerability analyses from systems to individual beings (Smith 2001, p.21, Wisner et al. 2004, p.55). A second cluster of approaches focuses on the vulnerability of social groups (people) and emphasizes the different types (social, economic, etc.) of vulnerability. A third cluster termed "situational" expresses three main contingencies of vulnerability: vulnerability changes depending on the hazard, the constant variability of people's situation in terms of

[7] In the 1980s, the conceptualization of disasters moved away from the food security research arena and led to the equation being changed from disaster as a function of risk (potential outcome) and vulnerability (D = R x V) to disaster as a function of hazard and vulnerability D=H x V/C (Davis, 2004)

access to key resources and power and lastly, the merging boundaries between "empowerment and marginality". Situational vulnerability therefore breaks out complexity and builds on the previous cluster. The fourth and final cluster singles out the specificity of vulnerability and exposure to damage and loss with regards to 'place' (Wisner 2001). Wisner concludes by re-inviting scholars to investigate the capabilities of groups labelled as 'vulnerable' or 'marginal' while outlining the "conditioning circumstances" provoked by history and global political economy that participate in long-term vulnerability production (Wisner 2001).

The first disaster risk studies framework is the risk-hazard paradigm (or approach) which evolved over the last three decades at the frontier between social and environmental systems. Its main characteristic was that it sought to identify those exposed to hazards or at risk of experiencing shocks/stresses and the "drivers of the nation's increasing vulnerability to losses" (Cutter et al., 2009). However, as echoed in O'Keefe et al.'s (1976) seminal paper, scholars progressively put forward the role of "political and economic struggles" in the intensification of vulnerability and the steady increase in the frequency and/or number of disasters (Cutter et al., 2009). The problem here is that risk-hazard based models not only do not account for varying degrees of hazard impacts, but also cannot account for differential impacts on different "subsystems" (Turner et al., 2003). It assumes that hazard events are rare which means that disasters are mainly the product of 'extra-ordinary' natural events (Füssel 2007a).

A second disaster risk studies framework proposed is the hazard-of-place approach located at the interface of risk/hazard and political perspectives. First formulated in 1996 (Cutter), the model has two dimensions: the "potential sources of risk" and the "contextual nature of risk itself" (Cutter 1996, p.67-68, Schmidt-Thomé 2006). It describes the interaction between biophysical vulnerability (exposure) and social vulnerability within a specific spatiotemporal context to create a "vulnerability of places" (Cutter 1996, Cutter et al. 2008b, Mustafa et al. 2008, p.3, Cutter et al. 2009). The differential nature of hazard impacts is acknowledged but it fails where the PAR succeeds in that the model does not account for root causes of social vulnerability and fails to contextualize it within the global forces of change impacting on it (Cutter et al. 2009).

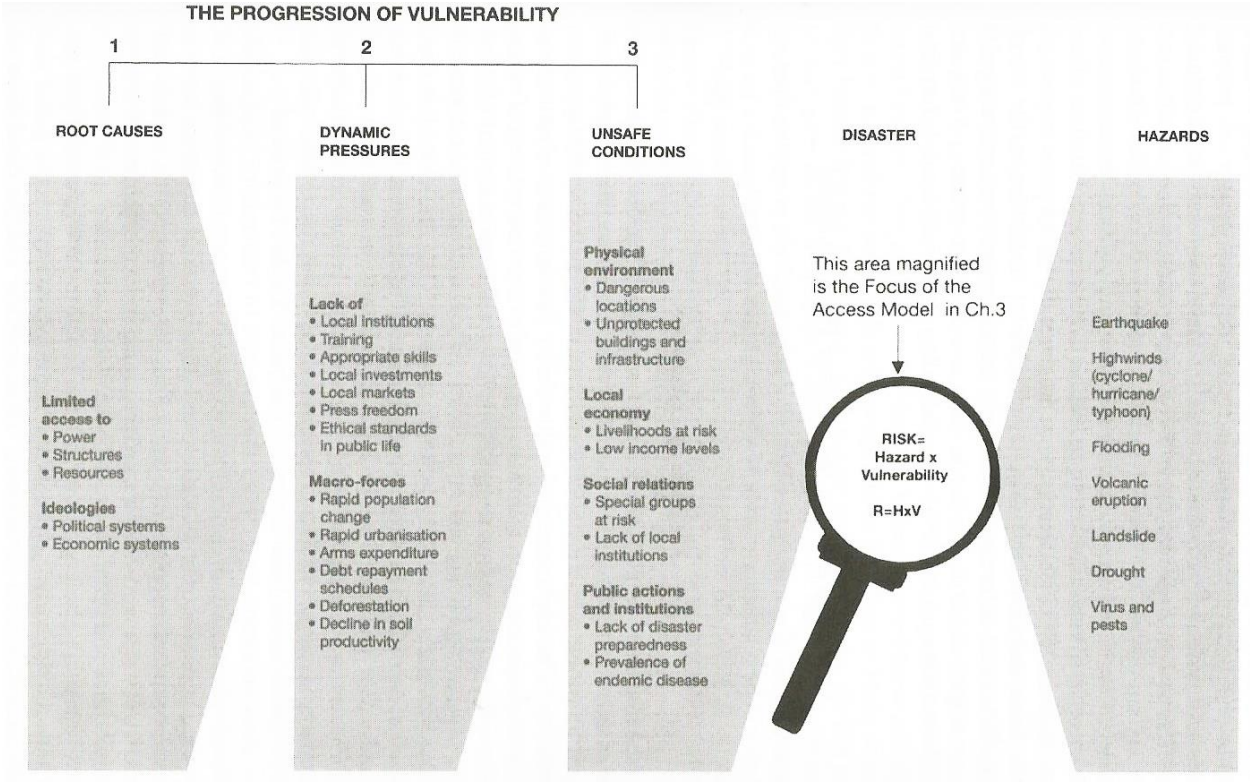
The third and final framework contribution to disaster risk studies corresponds to the Pressure and Release (PAR) model (sometimes called the "crunch" model) where risk was postulated as a function of the "perturbation, stressor, or stress" of the unit of analysis. The PAR model

has previously been applied for the study of vulnerability to volcanic activity in the Azores (Dibben et al. 1999), farmers' vulnerability to drought in Southern Namibia (Fara 2001), infrastructural vulnerability to cyber-attacks (Hellström 2007), vulnerability to environmental hazards in small island developing states (Mercer et al. 2007), vulnerability and risk perception with regards to HIV/AIDS (Tsasis 2008), vulnerability to the 2005 earthquake in Pakistan (Yasir 2009) and vulnerability to river flooding in Norway (Rauken et al. 2010).

As shown in Figure 2.1, the main focus is on the "root causes" and "dynamic pressures" behind the making or creation of "unsafe" conditions (Blaikie et al. 1994, Cannon et al. 2003, Wisner et al. 2004). Human-centric, 'hazards' here refer to natural events that "may affect different places singly or in combination at different times" (Wisner et al. 2004, p.49). Risk of disaster is seen as function of both hazard and vulnerability (R = H x V). 'Disaster', the interpretation of which is particular to the model, corresponds to the "intersection of two opposing forces: those processes generating vulnerability on one side, and [those behind] the natural hazard event on the other" (Wisner et al. 2004, p.49, 50, 60, 61). The 'release' part of the model symbolizes disaster reduction through the reduction of vulnerability as a means to alleviate the 'pressure' (Blaikie et al. 1994, p.22, Wisner et al. 2004, p.50).

For this study, the author re-adapted the interpretation of the above formula. In the context of this study, disaster risk is seen as R = H x V/C, with 'R' being disaster risk, 'H' being the hazard, 'V' being vulnerability (exposure and susceptibility) and 'C' as the adaptive capacity (adaptive mechanisms, coping strategies and adaptive strategy). Adaptive mechanisms are considered actions inherent to nomadic pastoralism necessarily used to counter the 'normal' and unpredictable behaviour of various environmental variables. Coping strategies are those immediate actions taken within the household to 'buffer' temporary stresses and shocks threatening household food security. Adaptive strategies (not to be confused with coping strategies) are long-term responses to prolonged and/or intense impacts from stresses or shocks on rural livelihoods. Consequently, these strategies usually include sedentarization, sending children to school and sending household members to the city to find wage labour.

**Figure 2.1 Pressure and Release (PAR) model: the progression of vulnerability**




*Source: Wisner et al., 2004, p.51*

Interestingly, despite the fact that the PAR model described in the first edition of *At risk: natural hazards, people's vulnerability and disasters* (Blaikie et al. 1994) is considered as belonging to the school of political economy (Sapountzaki 2012, Birkmann et al. 2013a, Joseph 2013), it was criticised for neglecting the political causes of disaster vulnerability at the national and international scale. This claim was then dismissed by the authors in the 2nd edition of the book (see Wisner et al. 2004, p.31-32, Birkmann 2006, p.31). Rightfully so, the criticized authors showed that social-political causes of disaster are included in the analysis by investigating their aetiology and production as part of the historical root causes of vulnerability whereas their preservation and influence on more contemporary political and economic systems are addressed as dynamic pressures. In accordance with the research sub-questions of this study, these factors play a determining role in the access, management and re-allocation of resources among people and therefore must be part of the global production of vulnerability.

The PAR model was also criticized for its lack of precision in language and the tautological nature of vulnerability definition which would lead to confusion over its conceptualization (Alwang et al. 2001). This claim was also dismissed in the 2nd edition of the book. Wisner et

al. denounced the "mocking of the 'triumph of reason'" when the authors were falsely accused of claiming that "people are vulnerable because they are poor [which then makes them vulnerable]" (Wisner et al. 2004, p.32, Schneiderbauer 2007, p.15). In agreement with these authors, it is contended by this present study that although poverty is closely associated with vulnerability in the ASALs (Singh et al. 2014), it is not necessarily equivalent to vulnerability (Sumner et al. 2013), especially in a community where there is absence of a private property rights system in place and where immense solidarity ties (agnatic and/or affinal) exist between households. In a sense, while poverty is determined by relationships between community members, the generation of vulnerability incorporates other causal factors that may be societal, environmental and/or historical. Also, the chosen scale of analysis determines the factors of vulnerability that are revealed which may not include poverty at the systemic level (Fekete et al. 2010, Kienberger et al. 2013).

Even though this model is very well suited for this study, one main limitation of the model (acknowledged by the authors themselves) is the failure to satisfactorily integrate the unfolding process of vulnerability in combination with the dynamical hazard: the latter seems to be depicted as static (Blaikie et al. 1994, p.46, Cutter et al. 2009). It does not address the "coupled human-environment" system with regards to the vulnerability of "biophysical subsystems" and inadequately describes the hazard's causal sequence (Turner et al. 2003).

Despite its limitations, the PAR model is the most suited framework for uncovering the social progression of rural vulnerability to drought for this study. Its usefulness in this respect has already been demonstrated in the study of farmers' vulnerability to drought in Southern Namibia (Fara 2001). An examination of the research sub-questions shows that the emphasis of this project is on identifying the social-environmental causal linkages through time that might account for current rural households' vulnerability levels with regards to drought and/or severe aridity weather. Thus, as far as is known, this is the first time the PAR model is used to unravel the social-environmental factors of vulnerability production to a hazard at PhD level. In addition, this research is the first looking at the underlying causes of chronic rural vulnerability to drought in Djibouti.

## 2.4 Conclusion

This chapter reviewed the conceptualization of drought, environmental change and vulnerability in the literature to clarify their use and relevance in the context of this research. It indicates that the hazard to be focused on is meteorological drought which includes an examination of climatic variability and long-term changes in rainfall patterns over Dikhil region and the Horn of Africa in general. Although the definition of drought in the context of rural Djibouti is addressed in Chapter Six, it corresponds to 'abnormal' departures from normal rainfall patterns and can manifest either in quantitative terms or through extreme temporal variation. This discussion also concerns both the environmental and social drivers of environmental change and desertification and their feedback loops on rural livelihoods.

Environmental feedback loops are known to incorporate internal ecosystem feedback mechanisms on the one hand, and global circulation changes related to patterns of SSTs on the other. Environmental changes drive rural livelihood change which in turn influences land-use change. Indeed, several agents of change interact including anthropogenic factors, temperature and rainfall changes, atmospheric composition and biogeochemical cycles. The main implication here is that the central role of drought as being responsible for chronic food crises in the region is not that simple. On the contrary, the land degradation process itself is complex, not well understood and does not constitute a definite proof for the desertification narrative given the reversibility of ecosystem thresholds in non-equilibrium environments. Hence, the research intends to contribute to the debate by investigating the social-ecological dynamics part of the production of pastoral vulnerability in the specific context of rural Djibouti.

A critical review of the different schools of thought and existing analytical frameworks indicates that the disaster risk perspective is the only vital theoretical approach capable of yielding useful insights for this research. Inspired from both the political economy and political ecology perspectives, the geographical approach to be adopted for this study must incorporate social and environmental interpretations on one side and qualitative and quantitative data collection on the other. Despite the lack of consensus on definitions, terminology, policy relevant indicators or indices, this research thus positions itself within the disaster risk studies.

To address the three research sub-questions, the PAR model is the most suited analytical tool to uncover the social progression of rural vulnerability to drought. Given the problematic targeted, the emphasis of this project is on identifying the social-environmental causal linkages through time that might account for current rural households' vulnerability levels with regards to drought and/or severe aridity. As a result, it involves uncovering the root causes behind rural livelihood change, the dynamic pressures responsible for reinforcing this change and the unsafe conditions of living responsible for the expression of current household vulnerability to drought. The next chapter exposes the geographical approach and the methodology adopted for this study.

# 3 Methodology: geographical approach and methods

## 3.1 Introduction

This chapter presents both the geographical and methodological approaches used to investigate the various research sub-questions behind the social-environmental drivers of vulnerability to drought in Djibouti.

The first part of the chapter discusses some of the theoretical underpinnings of this research, their origin and the justification behind the geographical perspective chosen for this study. It includes the concrete methodological and scalar implications of the geographical approach adopted.

The second part deals with the operationalization of the research in the field. After indicating the units of data collection, it describes the successive stages followed in the generation of primary data and the collection of secondary data. It also involves a discussion about the major challenges encountered and the solutions applied to overcome these. Finally, it finishes by laying out the various tools used in the analysis and interpretation of the data collected through the fieldwork.

## 3.2 Discussing the geographical approach to rural vulnerability to drought

### 3.2.1 A critical discussion of approaches to investigate social-environmental processes

From the early 1930s, different leading thinkers propounded a variety of approaches to geographic understanding from different philosophical and theoretical perspectives (Aitken et al. 2006) which have considerably enriched and shaped the way the environment can be viewed and provided us with invaluable insights in the dynamics of the society-nature interface. The first geographical approach reviewed for this research is Auguste Comte's positivism which gained much prominence from the 1920s until the late 1950s. Positivism in its broad sense prioritizes "the actual, the certain, the exact, the useful, the organic, the relative" (Aitken et al.

2006, p.14). It manifested itself through two common forms based either on verification (logical positivism) and/or falsification (critical rationalism) (Kitchin 2006, p.20). Its inception permitted the growth of quantitative geography in the 1960s and what has been labelled "spatial science" (Gregory et al. 2000). However this approach is not suited for this study because the approach does not consider people's choices according to their history or ideology. Severely lacking normative function, the approach does not address class division, geopolitical tensions or ecological problems which, despite the difficulties in quantifying them scientifically, must be taken into account for this study. Therefore, positivism (i.e spatial science) specifically lacks a fundamental and robust ontological, epistemological and ideological base because humans are geographical agents (economic actors as well as moral and cultural beings) who inherently give a reality to meanings. In addition, people must be considered in relation to rural livelihood change and the elements that constitute their livelihood base (Kitchin 2006).

The second approach considered for this study was the humanistic geographical approach which appeared as a tentative response to the problem identified with positivism. Associated with a specific intellectual orientation that emerged in the 1970s and 1980s, it recognizes that individuals do choose pathways within the city (or rural space) in terms of distance, time, cost-minimization, perception of danger, sense of belonging or aesthetic sensibilities according to their experience of place (Entrikin et al. 2006, p.32). This is a significant point that is part of the social understanding of vulnerability at the household level. For instance, it is relevant in terms of rural Ethiopian peasants' access to market towns, the effects of resettlement and forced displacement programmes led by the Government as a response to the late 20th century famines on the people or even in terms of simple access to sufficient and fertile land to durably sustain the household. However, humanism (or more specifically humanistic geography) does not account for economic, political and cultural factors of choice and action limitations. Something new was therefore needed to incorporate not only the social construction of discourses absent in positivism but also the structural constraints placed upon the people. The latter concern fed the "structure-agency" debates of the 1980s where alternatives such as behaviourism (or more precisely behavioural research in geography), structural theory and critical realism were proposed.

Behavioural research is the third geographical approach considered. It emphasizes perceptual and/or cognitive based research and differentiates itself from other approaches in the sense that it is a "process philosophy". Borrowing techniques from other disciplines (qualitative and/or

quantitative data collection), it eulogizes sense-based appreciation of reality to understand the process that guides thinking, reasoning as well as acting. It questions and tries to comprehend geospatial patterns found in human-environment relations (Golledge 2006, p.80). Since the approach focuses on individuals rather than on groups and/or populations, it misses the existence of broader social and environmental constraining factors mentioned in the earlier paragraph. Although this research takes place at the household level, it seeks to include large social processes of change in relation with environmental changes and fluctuations. What is implied here is that people's choices and opportunities are limited not only by immediate factors but are also determined by historical social remnants from root causes. This may be why structuration theory was considered more appealing than behavioural research by many geographers.

In effect, structuration theory explores ways in which actions and practices interact with structural constraints to transform and reproduce social structures. As it germinated in the 1980s, within the agency-structure debate and from a geography perspective, the approach acknowledges inherent spatiality to social life. It questions how social systems are bound together in time and space without granting any degree of primacy between human agency and society. This is powerful in the sense that constraints (economic, political and cultural) and empowerment are "internally created and transformative through action inside a set of conditions and rules" (Giddens, 1984 quoted in Dyck et al. 2006). I would argue that although the approach does indeed acknowledge constraints or rules that bind, delimit and enable action, it makes the presumption of the existence of these structures without first questioning how these structures were generated to begin with. There is the assumption *inter alia* that social structures constrain individuals' actions but where do they originate from? The author's second contention is that the theory rejects the degree of autonomic evolution/change that characterizes natural elements like the land or the weather. This is where realism distinguishes itself from structuration theory. Radically *in contra* with the latter, realism rather underlines the independence of the world from human thought processes. Critical realism (which finds its main source from Kantian idealism) asks who is doing the constructing process over time and puts an emphasis on the ideographic nature of these processes.

Structuration theory could to some degree be seen as a precursor to the following post-modern age which sprung in the mid-1980s from a lost faith in "metanarratives" of modernity (Harvey quoted in Clarke 2006, p.114). Briefly, Doel and Lyotard describe it as some kind of sensitivity

to the unrepresentable. Concerned with an interpretation of the status of the world, post-modernism is rather a way of operating and a state of mind instead of an approach *per se*. Post-structuralism on the other hand is a radically anti-essentialist approach (in contrast with structuration theory) where meaning and identity are seen as effects rather than causes. As a process of maturity constantly questioning "graduation" thresholds, it tries to define an ontology of people from within the system (Harrison 2006, p.124-125). In relation to this present study, the main positive aspect extracted from this approach is that post-structuralism produces immanent critiques. This is one key feature of our study where the author's aim is to exhume *tabula rasa* the role and power of relationships, linkages and connections that exist between the different socio-economic, political and environmental elements and households' opportunities and constraints. More specifically, it helps to determine the array of opportunities offered to the people in terms of their adaptation capabilities depending on the intensity and the duration of drought impacts.

As a result of this discussion, the overarching geographical outlook chosen for this research is post-structural in nature without any pre-determined assumptions about linkages, structures and/or factors of limitation. It follows that to unearth the root causes of vulnerability, the author's fieldwork relied on people's immanent information and expressions untouched by external influence. The next sub-section discusses in more detail some of the methodological implications of the post-structural geographical approach to this study.

### 3.2.2 Post-structuralist implication of the geographic approach

The 1990s witnessed a discursive turn in geography which permitted political ecology to develop and reformulate its perception and understanding of society-nature relations aside from constructivist insights (Blaikie 2008, Robbins et al. 2008). Efforts in defining "truth" or "reality" need to be understood as part of the process of discourse production within a set of social, cultural and historical contexts and shaped by relations of power (Davis 2003, Datta et al. 2008, Walters et al. 2009). This research aims at uncovering the social-environmental factors of changes in the meanings over nature, land, cattle and other relevant factors of vulnerability.

The focus of this project is situated at the household level. It is our hypothesis that pastoralists' heightened vulnerability is linked to root causes of rural livelihood change which may be social, political, economic or environmental. According to Escobar, nature, bodies and organisms must be seen as "material-semiotic" actors rather than mere objects of science. Nature and organisms emerge from a "discursive process involving complex [mechanisms that are cultural, economic and political]" (Escobar 1996, p.337). The Mexican ecologist Enrique Leff conveys this nicely when he says that "the environment should be regarded as the articulation of cultural, ecological, technological and economic processes that come together to generate a complex, balanced, and sustained productive system open to a variety of options and development styles" (Escobar 1996, endnote 57).

This research attempts to unearth these social-ecological relationships which are hypothesized to have been upset and disentangled due to competing systems of meaning and perception over pasture lands of the Horn of Africa. These social-ecological processes determine meaning, use and potential conflicts of interest over land appropriation. Post-structuralism rejects the class-focused assumption of early political ecology. It promotes the analysis of discourse (or ways of representing social realities) through anthropological information to understand the social construction of Nature. Methodologically speaking, it involves not only the analysis of secondary texts and reports written by varied sources situated at different hierarchical levels but also real-time ethnographic research in the field (interviews, participatory observation, focus groups) which will inform the research to "construct accounts from within the processes of change" (Busch et al. 1997). Practices do not operate independently from social processes. They need work. Struggles over ecosystem services, nature, land and meaning are simultaneously struggles over identity and rights (Braun et al. 2001, p.59). This is where power plays its part. As power relations are born, discourses, knowledge and spaces are formed and co-evolve in complex ways to reach some kind of stability (Braun et al. 2001, p.60, Murdoch 2006, p.56). Power relations are therefore ubiquitous and immanent.

This research does not adopt an international development perspective on the problem of drought-related food insecurity. It does not pre-suppose the causal significance of one historically singular experience on vastly different groups of people (Davis 2003). Instead, the research seeks to account for idiosyncrasies proper to the Afar and Somali-Ise. These spaces shall be studied through formal qualitative methods such as participatory observation and focus-groups and semi-structured interviews to empower and 'give a voice' to social groups

that could have been neglected by conventional geographical approaches and methods. Our interest is in digging up the forces that are systematically disempowering and "disenfranchising" marginalized groups of people (Murdoch 2006, p.13, Louis 2007). Through an ethnographic approach and close study of secondary accounts found in documents, the study investigates the processes of marginalization and power imbalances.

All in all, post-structuralism understands meaning and identity as arising from interactions between system-wide relations and divergent "readings" of those relations. This interest places itself within the geographies of resistance which focus on how social groups and social actors work to "subvert and appropriate space in the face of hegemonic tendencies within the system as whole" (Murdoch 2006, p.13). For this study, our departure point is the pre-colonial period in the area that is Djibouti today. The focus is on Afar's, Somali-Ise's and France's perceptions of nature and systems of signification and how these have fed imbalances of power within their communities. The changes associated with colonisation and independence are included in the analysis.

### 3.2.3 Considerations of scale for this research

This research project views scale as the emergence of relation. By virtue of this statement, there is no single 'correct' scale for the analysis of social or ecological systems and phenomena and one cannot assume linearity across scales. As stated by Piers Blaikie and Harold Brookfield, "[i]t is very evident that we must take care to define the scale at which we are working if the social causes and consequences of degradation are to be described adequately" (quoted in Sayre 2009, p.102). Although there are different conceptions of scale which vary according to the discipline and school of thought within which it is used, a convergence has occurred between ecological and geographical perspectives in the past two or three decades. In parallel to this tendency, a growing body of researchers have progressively moved from scale as size and level to scale as relation (Sayre 2009, p.105). This present thesis falls in line with this tendency as it leans towards using an integrated conceptual framework with interest in the establishment of hierarchies and networks, non-equilibrium theories of rangeland ecology, spatio-temporality and self-organisation. This sub-section does not review the literature over the geographical relevance of scale (see Marston et al. 2005, Collinge 2006, Hoefle 2006, Jonas 2006, Escobar

2007, Jones et al. 2007, Leitner et al. 2007). Rather, it presents and discusses the perspective of scale adopted for this study.

Scale as relation is strongly distinctive from scale as level. However, the former does not necessarily deny the ontological relevance of the latter. In ontological terms, we rather grant precedence to relations and connectivities (scale as relation) over the vertical categorization of action (scale as level). By focusing on interactions and associations between different socio-ecological entities, it is possible to dwell on the intimate feedback loops that co-constitute social life instead of analysing the social on one side and the ecological (or natural) on the other before appreciating the connections that exist between the two. Methodologically speaking, it is also important to differentiate between Euclidian and topological space. The former (also related to topographical space) refers to spaces of "fixed coordinates, with lines that run across surfaces" as in the style of maps with interest in the lines between these points (Box 4.2 in Murdoch 2006, p.88). Deemed too superficial a perspective for understanding spatial relations, this research adopts the topological representation as an attempt to move away from Euclidean space (Hess 2004, Ruming 2009).

Place as a rural area is seen as the site of interaction between network topologies and territorial legacies. The rural area corresponds to the "subtle folding together of the distant and the proximate, the virtual and the material, presence and absence, flow and stasis, into a single ontological plane upon which location – a place on the map – has come to be relationally and topologically defined" (Jones 2009, p.487). This means that space may combine multiple processes, relations, identities and material arrangements (Murdoch 2006, p.85). With this bundle of interactions, social networks are generated between nomadic groups with their own specific space-time configuration, ultimately leading to a network topology (Murdoch 2006, p.88). This research is interested in the (in)stability of these network topologies and the nature of the social-environmental power dynamics that ensure their continued existence and/or (un)sustainability (Murdoch 1997).

Similarly to Massey's perception, it is believed that space and time are relative concepts determined by the nature and behaviour of the entities that "inhabit" them. In this sense, the concept of "relative" space is object-oriented which is distinct from absolute space as it is geometrically defined (Massey 2005, p.2). Moreover, with regards to scalar dualisms, the words "local" and "global" are different viewpoints about the dynamisms of networks that are

by nature neither local nor global but vary in length (more or less long) and strength of connection (more or less connected). This post-structural outlook on causal connections suggests that the length of networks determine scale with some networks tied to what would be termed 'the local' as the PAR model's unsafe conditions and others extending over much greater distances in space (termed 'the national' or 'the global') or time as the PAR model's historical root causes of current rural vulnerability to drought (Marston et al. 2005, p.71-72, Murdoch 2006). Therefore, space (in the topological sense) is made by processes. This relational making of space is simultaneously a consensual and contested process. It follows that if space-time is relational, then the 'nature' of vulnerability is itself a production of its spatio-temporal locality. This articulation of interrelation produces 'space' which implies that phenomena (vulnerability), relations and space-time are mutually constitutive (Massey 2005, p.4). Another point is that, beyond Euclidian space, spatial relations are about power relations which are involved in the making of space (Murdoch 2006, p.22-23). In return, this spatial making (or 'spacing') can be strongly prescriptive or relatively fluid in Nature. In this sense, space is fundamental in any exercise of power (Murdoch 2006, p.52, 98). Since networks constantly form, vanish and reform, there is constant 'spacing' going on.

As a result, the uncovering and analysis of root causes, dynamic pressures and unsafe conditions in the social-environmental production of vulnerability although epistemologically separate and successive, draws on connections that transcend space and time. In this study, secondary historical data will inform us about vital historical connections between major events and rural livelihood change while ethnographic and participatory research on current rural households' livelihoods will present a snapshot of the nature of pastoralists' vulnerability (including susceptibility, exposure and capacities) in relation to their unsafe conditions. This snapshot does not mean that rural households' vulnerability is therefore static nor does it mean that it should be conceptualized as not inherently linked to other places (outside the object of study) or that the character of its constitution is not significantly a product of wider embeddednes (Massey 2005, p.4). Objects, people and topological spaces are always interlinked across topographical space and conceptual bridges.

To sum up and conclude this sub-section, scale was firstly seen as relational. Secondly, theorizing about scale before embarking on the research is meant to warn the reader that this research emphasizes processes rather than scale *per se*, as it is through processes that relations among phenomena and structures are manifested. Thirdly, these processes are simultaneously

spatial and temporal (or intrinsically spatio-temporal). Fourth, scales are produced, whether by human-social, geophysical or biological processes. As Sayre stated it, scales have an 'ontological moment' as part of the material processes they are a part of; and they have an 'epistemological moment' as one's scale of observation influences the patterns that one observes. "The two moments are dialectically related" (Sayre 2009, p.105). This study focuses on how diverging networks, social relations and interests operated across scales without necessarily invalidating the importance of scalar hierarchy. It is an attempt at showing how particular material structures and processes have become fixed at or around the sites of interest for this research. This study of vulnerability to drought will therefore unearth spatial and temporal connections beyond scale while also including an assessment of pastoralists' unsafe conditions and current vulnerability through participatory methods.

## 3.3 Fieldwork and data collection techniques

Before flying to Djibouti, I obtained ethical approval to initiate my fieldwork. The necessary ethical documents are displayed in Appendices 18, 19 and 20.

### 3.3.1 Units of data collection for fieldwork

The household, in its broadest sense in the pastoral context, was the unit of study and analysis for this research. Although the extent and nature of communities and households were expected to vary according to relationships, economic and political factors, fieldwork was undertaken with the idea of considering pastoral households as the sampling units. Both quantitative and qualitative data were gathered.

- The household (family) level was the basic production and management unit within the community. Decision making, labour division as well as household resource management and allocation were set up at this level. Moreover, livelihood strategies, adaptation and coping capacities were most visible and followed within the household. Consequently, pastoralists' household survival strategies were uncovered through structured household surveys conducted in the selected villages.

- The village or community level was the social structure part of pastoral politics. Collective action was pursued at this level and also affected individual members, households and groups differentially according to social class, economic and political contexts. Data gathered at this level was therefore of relevance to our analysis.

- The identification of leadership and "sector offices" in contact with these pastoral authorities was also crucial as they were the intermediaries between government ministries officials and rural households. Thus, data collection was effectuated through group and individual interviews with local leaders and (NGO, ministry) staffs.

Data was generated and gathered by combining several methods and data sources, a mixed-method approach which is sometimes referred to as 'triangulation' in the literature. This research involved collecting, analysing and interpreting qualitative as well as quantitative data in order to address the research sub-questions. Data gathering involved the use of focus group interviews, individual interviews of key informants, participatory observation (ethnographic work) which also included household life stories and semi-structured interviews. The fieldwork spanned two distinct periods which were different in nature. The first period, which extended from March 2011 to May 2012, was completed with the help of only one research assistant while the second period, which took place from October 2012 to October 2013, involved the work of eight field technicians. Before discussing the actual fieldwork, the process of research site selection is first presented in the next sub-section.

### 3.3.2 Choice of the research site: rural Djibouti

The initial aim of this study was to evaluate rural households' vulnerability through the application of one or more vulnerability indices in Jijiga zone, Ethiopia. However, it was too difficult to obtain the necessary permissions and local logistical support to conduct the fieldwork. As a result, my departure into the field was delayed for many months although the background on vulnerability to drought in the Horn of Africa context still proved valuable and relevant to the overall research.

In addition, the original theoretical framework to be applied was actor-network theory (ANT) as an innovative perspective on vulnerability (Murdoch 1998, Murdoch 2000, Latour 2005,

Bosco 2006, Ruming 2009). In this regard, I originally planned to complete semi-structured interviews and focus-groups complemented by fuzzy-logic methods to quantify pastoralists' vulnerability to drought (Alcamo et al. 2008, Krömker et al. 2008, Taenzler et al. 2008). However, given the nature of the data collected and the lack of time spent doing ethnographic research, ANT was replaced by the PAR model as an explanatory framework better suited to investigate vulnerability production in Djibouti.

Eventually, I considered changing my research site to neighbouring rural Djibouti which exhibited a similar semi-arid/arid environmental context as in Jijiga zone. Although I am French, I had connections to Djibouti which represented a better chance for me to operationalize the research. This proved to be the case and therefore I changed my research site to rural Djibouti and went there for a first fieldwork visit. My fieldwork took place at a time when the major 2011-2012 Horn of Africa crisis erupted, making headlines across the world. In response to the crisis, humanitarian programmes were implemented throughout the region (including rural Djibouti).

In the meantime, being self-funded, I was struggling with the logistics and cost of rural-based surveys. When I was offered a position as an International Consultant in Food Security for the Food and Agriculture of the United Nations (FAO-UN), I accepted it knowing that I would both be helping the humanitarian response and working on food security issues relevant to the PhD research. Despite delaying the fieldwork component, my direct engagement with the Djiboutian crisis, the donors and humanitarian partners working in the food security sector was an invaluable advantage. In the long run, it contributed to my understanding of the contemporary structural issues facing rural Djibouti and the concepts framing government and agency understandings of rural development there.

### 3.3.3 Primary data collection

- *First part of the fieldwork*

From March 2011 to May 2012 (excluding the month of February when I was based in Sankal village) I was based in Djibouti city which is the centre of political and economic power. Given the extreme centralization of power in Djibouti City, the first step consisted in introducing

myself and my work to the ministers and secretary generals of the Ministries of Agriculture, Water, Fishing, Livestock and Fishery Resources (MAPE-RH) and of Interior of Djibouti (MID) whose sectors of intervention in livestock, agriculture and food security were of interest to this research. At the same time, I familiarized myself with the informal power structure which, contrary to official organization charts, was based on agnatic, affinal and tribal ties.

During this first period of my fieldwork and as mentioned in the previous sub-section, I was recruited by the FAO-UN which allowed me to obtain infrastructure and transportation support. My work consisted of centralizing for the first time all the information and data on food security to set up the first food security database in the country. Since the FAO worked in partnership with national ministries (especially the Ministry of Agriculture), I was able to access more detailed geographic and social-environmental information at both the national and district level. The FAO position thus facilitated my visiting a variety of localities which were hard hit by the drought. Given the food insecurity and livelihood profile of its community, Sankal was eventually selected as one of the five study sites.

Several methods for data collection were used in Sankal. These included individual in-depth interviews, ethnographical research, participatory observation, and semi-structured interviews.

*i. Individual in-depth interviews*

These were conducted in a formal and informal way. The former involved preparing a list of questions for guiding purposes. The themes covered included difficult life challenges related to drought and food insecurity, livestock population trends, access to and use of pasture lands, household dynamics and life history as well as environmental changes. At the same time, 'experts' working in rural areas but based in Djibouti city were interviewed about certain practices, experiences, indigenous knowledge and the workings of institutional networks. Those interviewed included clan leaders and elders but also youngsters, migrant workers and shop keepers (sellers). Informal interviews through random conversations were practical and informative once good rapports were established with the locals. Also, thanks to my FAO position, semi-formal interviews with local officials and sector experts involved in development programmes, food crisis resolution, businesses or socio-institutional conflicts at the local level were conducted. These included government officials and heads of relevant sector offices (e.g. agriculture, health, education, land management). These individual interviews were written down or tape-recorded upon consent.

*ii. Ethnographical research and participatory observation*

Information on everyday life was gathered through observation such as personal histories, inter-generational and gender exchanges, power relations within and outside the household, marketing and traditional beliefs and customs. The author also kept note of life experiences, household challenges, coping strategies, and networks of influence within and between households in decision-making.

*iii. Semi-structured interview questionnaires*

After about five months of work with the FAO, I had become familiar with different pastoral settlements and neighbourhoods in Dikhil region. During that time, I had also conducted initial interviews in Sankal[8] to test some of the questions that should be incorporated in the questionnaires. Semi-structured interviews were conducted with 80 households in Sankal between January and March 2012 (Appendix 1). The majority of respondents were female because most of the men who had lost livestock were often outside the home at the local mosque, at some gathering, at the hospital in Dikhil city or in Djibouti city. The topics covered included: historical drought occurrence, land use (crop cultivation, livestock rearing, etc.), human and social capital, formal and informal transfers, current food security and consumption, changes in livestock numbers and livelihood systems (constraints and opportunities). Semi-structured interviews helped me to triangulate and complement the ethnographical information already gathered. A research assistant was recruited to conduct the interviews, transcribe and translate from English to Somali and from Somali to English for the interviewees' responses. Since I understand Somali, I could get the gist of both the assistant's questions and the respondents' answers to check for useful information.

The results obtained from fieldwork in Sankal are discussed in Chapters Six, Seven and Eight.

- *Second part of the fieldwork*

Given the logistical constraints of the workload associated with my contract with the FAO and the 2011-2012 food crisis, I did not have enough time to cover a sufficient number of villages during my first fieldwork phase. Consequently, a second trip back to Dikhil region was planned. During this phase, I was recruited as a Food Security and Livelihoods (FSL) and

[8] A map showing all the study sites in Dikhil region can be found at Figure 7.3 of Chapter Seven.

Disaster Risk Management (DRM) Programme Manager by Action against Hunger (ACF-International). Based in Djibouti City from October 2012 to February 2013 (about four months) and then in Dikhil city from March to October 2013 (about eight months), I led eight ACF national staffs for the completion of Participatory Vulnerability and Capacity Assessments (PVCAs) and the generation of Coping Strategy Indexes (CSIs) in the context of drought in Hanlé 2, Koutabouya, Bondora and Dadahalou. The research team was composed of: three field technicians in DRM (trained by the author), one in mental health and care practices, one in agro-irrigation, one in Water, Hygiene and Sanitation, one in animal health and a veterinary specialized in livestock and pastoral livelihoods. Gender and cultural characteristics of both Afar and Somali ethnic groups were taken into account in my choice of the field technicians prior to the implementation of the PVCAs.

Here presented are the different steps followed for this second part of the fieldwork:

*i. Consultation of authorities*

The Prefect, Deputy Prefects and President and Vice-president of the Regional Council of Dikhil were consulted beforehand. They were briefed on the nature and outcome of the project, its implications at the community level and the villages to be targeted. This also allowed me to have a better understanding of the historical and current context, issues, best practices and ongoing activities to avoid any wrongdoing in the field.

*ii. Secondary data collection*

This phase was particularly important because it allowed for a better understanding of the context to ensure the adequacy of the actions, participatory exercises and questionnaires used in the target villages. In particular, information about the history of disaster in the region related to drought and other non-drought hazards through informal discussion with the locals and state officials in Dikhil region was included in the study.

*iii. Initial meetings with communities*

The first two-three weeks after the opening of the ACF-Dikhil office were devoted to familiarizing the DRM/FSL team and the communities with the project. These informal sessions were held with the team and in the presence of state authorities based in Dikhil region and influential members form the study sites.

*iv. Preparing the community*

This step consisted in presenting the PVCA to the village chief and influential people in the communities. It also enabled me to establish a work plan for each week in accordance with the community. It involved a minimum of three-four hours per day and the establishment of the right conditions for carrying out the study which required the presence of at least ten participants. Given the fragility of their livelihood, human vulnerability and the hard work related to daily chores, households were never forced to attend these sessions.

*v. Focus group interviews and implementation of the PVCAs*

Group sessions were always preceded by open meetings, usual traditional greetings and consultation of village authorities with a clear description of the daily activities related to the PVCA. Subsequently, two groups would be formed: a group of women on one side and a group of men on the other. The goal was not to extrapolate sample results to the population level but rather to create an opportunity for research participants to engage in "in-depth, flexible engagement [with their food insecurity problems]" (Secor, 2010, p.199). Since the people of interest were strictly Afar in Hanlé 2 and Koutabouya, and strictly Somali in Bondora and Dadahalou, the study sites were homogenous.

Both gender and ethnic (Afar and Somali-Ise) categories were adequately represented in the selection of the team members to capture any gender and cultural differences in perceptions and opinions for the PVCA. Six participatory tools that were used to gather information about communities' risks, capacities and vulnerability:

1. *The community profile* identified the geographic and demographic elements and revealed the existence and access to social services (health and education) and livelihoods profiles.
2. *Risk mapping* allowed communities to represent on a map spatial information about infrastructure, natural resources and risks as well as those households most vulnerable.
3. *The history of disasters* permitted to locate major disasters on a time-scale and to determine their frequency and their significance in terms of their duration and impact.
4. *Hazard ranking* revealed the major threats faced by communities in the study sites. It also helped to understand the relationship between drought occurrence, its impacts on rural livelihoods and the role of non-drought hazards with regards to pastoralists' vulnerability.

5. *The seasonal calendar* exercise helped the villagers identify the critical climatic periods including the months when frequent food shortages (lean periods) are experienced in the villages.
6. *Analyses of vulnerability and capacity tables* unravelled households' exposure and susceptibility to various hazard impacts and the resources at their disposal to mitigate these effects.

The participation of group session attendants meant that they were consulted and took part in the exchanges to promote their ownership of the exercises under the guidance of members of the investigative team. The approach was as non-discriminatory as possible so that all members of the society were allowed and encouraged to participate, especially marginalized groups. Friendliness, openness to dialogue and the use of simple visual tools facilitated the accessibility and understanding of concepts by all participants. All sessions were attended by community leaders. On one hand, even though they did not necessarily know the problems nor the issues experienced by targeted households, they were precious intermediaries between the community and the research team. On the other hand, their presence often intimidated and influenced the opinions of herders whereas it was less the case for women group sessions since the male community leaders did not attend those.

The results of the PVCAs dealing with the nature of pastoral households' unsafe conditions are discussed in Chapter Seven and pastoral exposure to non-drought hazards due to sedentarization and the nature of their vulnerability are discussed in Chapter Eight.

*vi. Structured interviews and the CSIs*

The CSI evaluates the behaviour of individuals and quantifies the decisions and choices made by people when they cannot access enough food. There are a number of fairly regular behavioural responses called coping strategies that are used by households to manage food shortages. These coping strategies are usually identified through observation, group discussions and structured interviews (Appendices 2-5). To generate the CSIs for Hanlé 2, Koutabouya, Dadahalou and Bondora, the first step consisted in organizing focus groups to make sure the coping behaviours to be used in the semi-structured interviews were actually implemented by rural households in the four villages. The second parameter that needed to be set was the recall period which determined the use frequency of those specific behaviours. In the case of this study, a recall period of seven days was chosen in order to generate results as

accurate as possible. Thirdly and under the guidance of the author, a severity classification was generated through several focus groups at the community level and helped the research team in assigning a severity score to individual strategies. From the respondents' answers, severity scores were established and individually assigned to each of the coping strategies. Maxwell et al. (2008) found that it is possible to perform some comparative analysis of community CSI scores across contexts, and using this method, village and household CSI scores were analysed and compared across study sites despite differences in the livelihood profile, the environmental context and certain cultural markers between the Afars and Somalis found in each village.

The results obtained from the CSIs are analysed and discussed in Chapter Eight.

*vii. Monthly and decadal rainfall data*

Through its Advanced Real Time Environmental Monitoring Information System (ARTEMIS), the Food and Agriculture Organization (FAO) of the United Nations exploits low-resolution satellite remote sensing data to monitor vegetation cover changes as well as rainfall behaviour over various areas around the world since 1988. In turn, these data are fed into the FAO Global Information and Early Warning System (GIEWS) on Food and Agriculture with the use of near-real-time satellite images from Meteorological Satellites (METEOSAT). These proxies for rainfall are combined with the Normalized Difference Vegetation Index (NDVI) information to provide the GIEWS with drought monitoring data (Minamiguchi 2005). For this research, decadal and monthly rainfall data for Dikhil region from 2007 to 2013 was extracted from the GIEWS database to be analysed and used in the study of Dikhil region's climate dynamics, succession of seasons and drought occurrence.

Overall, questions asked also touched upon lived impacts of drought, coping and adaptation strategies for survival, early warning systems in place, any serious flaws to be addressed and the nature of their conditions of living. The results obtained from the analysis of rainfall patterns in Dikhil region and rural Djibouti more generally at both the decadal and monthly level are specifically discussed in Chapter Six.

### 3.3.4 Secondary Data collection

The author gathered two different types of secondary data. The first type comprised information generated by government and non-government/international organisations which ranged from project documents, study reports, policy reports, planning documents and regulations in relation to pastoral livelihoods. Other documents included reports from UN agencies (UNDP, UNOCHA, WFP, FAO, etc.), the World Bank (WB), the International Monetary Fund (IMF) and various relevant ministries for this study.

The second type of secondary data gathered was from previous research projects (anthropological, sociological, etc.) on the subject and generally found in published journals, books, theses and conference proceedings. For this type of data to be accessed, the author accessed resources from the British Library of Political and Economic Science of the London School of Economics and Political Science (LSE), the School of Oriental and African Studies (SOAS) Library, the King's College London (KCL) Maughan Library, the *Catalogue général de la Bibliotheque Nationale de France (BNF)* and the *Catalogue collectif de France* but also the *Système universitaire de documentation*, the *Catalogue de la Bibliothèque Sainte-Geneviève*, the *Catalogue de la Bibliothèque publique d'information*, the Babelio catalogue, French documentation, the George Pompidou Centre Library and the archives of the Ministry of Foreign Affairs. In Djibouti, I consulted the archives of the Research Centre of the University of Djibouti including relevant documents from the research Centre based in the capital, namely, the Research and Studies Centre of Djibouti (CERD).

These secondary data particularly fed into the analysis of the connection between root causes and historical social-environmental drivers of change with households' current conditions of living and human vulnerability profile. Also, these data confirmed and/or complemented primary data collection and analysis.

Secondary data results are incorporated in discussion throughout the thesis although it particularly served as an important historical basis for the study of root causes of vulnerability and the dynamic pressures involved in reinforcing their effects on vulnerability production in Chapter Four and Five, respectively.

### 3.3.5 Major constraints and limitations

Several constraints and challenges significantly lengthened the duration of fieldwork in Dikhil region. The main challenges encountered included communications issues, the mobility of pastoral households, community contingencies, Ramadan during the summer calendar season, assistance culture, and the lack of communities' experience with PVCA tools.

*i. Communication issues*

Apart from the village of Hanlé 2 which occasionally incurred phone network problems, Bondora, Koutabouya and Dadahalou villages had no telephone network coverage. In view of the participatory nature of the PVCAs and CSIs associated activities/exercises requiring the presence and availability of certain key people in the community for the facilitation of group sessions, frequent trips by some team members to these villages were necessary. It was vital for communities to be regularly informed of our upcoming visits and activities to ensure their continued collaboration. Firstly, these trips often postponed certain activities. Secondly, in the case of an emergency or last minute event, the community experienced difficulty in contacting the investigative team based in Dikhil city given the great distances to be covered on foot. Consequently, there were frequent last-minute setbacks (absence of key members, nine-day long funeral events involving the whole community and others) which often postponed certain planned activities.

*ii. Agro-pastoral and/or pastoral profile of livelihoods*

The four villages were inhabited by agro-pastoral and pastoral households which meant that there was a lot of movement and travel of individuals and households. Also, this way of life of determines the configuration of villages. In the study sites, the *daboitas* (Afar traditional homes) and *toukouls* (Somali traditional homes) were quite spread out over long distances (up to 15 minutes on foot from one household to the next) whether in an ecosystem of plains (Hanlé 2 and Koutabouya) or rocky mountainous areas (Sankal, Bondora and Dadahalou). These geographical features represent an additional time-constraint on the study. The author managed to complete the structured interviews of targeted households needed for the generation of the CSIs by making the event coincide with the distribution of non-food essential items in the context of ACF's interventions in the study sites.

*iii. Community contingencies*

This constraint type was expected before the actual start of fieldwork. Difficulty in managing unexpected events at the community level combined with communication issues which often resulted in communities not being able to warn the investigative team in time at least a day prior to or in the morning activities were to take place. Unexpected events manifested in a variety of forms. They ranged from the mere absence of key community figures due to illness or private reasons to the death of important community members which, according to tradition, lasted up to nine days. Other unforeseen events included the eruption of tensions both within the community and between some members and the investigative team. Given the highly participatory nature of this research, there was frequent consultation and negotiation taking place both with state officials based in Dikhil city and the sub-prefectures and important indigenous figures with the use of affinal and agnatic ties to ensure the smooth implementation of community activities.

*iv. Vulnerability of rural households*

The PVCA activities began in the study sites in March-April 2013 at the end of the 2012-2013 *jilal* (dry) season which means that at that stage, rural communities' livelihoods were fragile and the individuals participating in the group sessions tended to be tired and exhausted. Given the lack of food and water in the region, communities were rather weak given the time to be allocated for the implementation of the PVCAs and the CSIs. For instance, the Bondora community nearly relocated somewhere else in the course of the PVCA due to the late distribution of the WFP's food rations. Consequently, participatory exercises and activities tended to happen in the morning when herders were still in the village before heading out to graze their animals and also because people used to be in better form in the morning. Group sessions would start around 9:30-10:00 am and rarely lasted beyond 1:00 pm. Fortunately, we were able to complete the PVCA before the peak of the summer calendar season in July-August. It was imperative to finish before *Ramadan* (holy fasting period in Islam) a period during which all Djiboutians, in rural and urban areas alike, tend to sleep during most of the day to preserve their energy until the *ftour* (breaking the fast).

*v. Culture of humanitarian assistantship*

Ethnographic observations made during the implementation of PVCA activities revealed that communities often thought that because the investigative team was working for a humanitarian organisation, they expected us to provide aid of some sort (food, non-food essential items,

medicine, etc.). The first few weeks were hard in trying to make the households understand that the study was meant to help them identify their unsafe conditions as well as some of the possible answers to solve them. In all the study sites, communities often hoped for emergency food assistance rather than long-term development activities. There are three underlying factors which challenged the operationalization of the fieldwork. Firstly, given the decade-long history of humanitarian food assistance provided to rural communities in Djibouti, they expected similar assistance from the investigative team. Secondly, because of excessive emergency assistance provided to these communities, a general feeling of helplessness was identified which translated into many male participants being unmotivated to participate in the study. Women were a lot more enthusiastic and motivated and were key participants for this study. Thirdly, respondents indicated that government officials who visited the study sites in the years prior to this study would usually quickly complete non-participatory food security surveys to have a snapshot of the situation without implementing any subsequent response. As a result of these factors, a lot of effort and time was spent in convincing rural households of the significance of this study.

*vi. No prior experience with DRM and PVCAs*

It was the very first time that a PVCA was being implemented in rural Djibouti. This fact is linked to several limiting factors in its implementation in the study sites. Firstly, communities had no adequate prior experience with DRM terminology, its concepts and objectives. Secondly, given the historical context of emergency response often applied in rural areas, successful implementation of the PVCAs required much advocacy and community mobilization efforts both in duration and intensity to cause a change from an 'assisted mentality' to a 'mentality of recovery and livelihood reconstruction' for them to identify and analyse their livelihoods and conditions of living. Despite the efforts of the investigative team for this study, it is suggested that this shift in mentality cannot happen in such a short period of time. Thus, to overcome this constraint, an important long-term advocacy work needs to be applied with the necessary involvement of influential community members with DRM training. Such work in conjunction with the implementation of micro- projects aimed at livelihood recovery would ensure more effective transmission of certain DRM behaviours and new sensitivity in decision-making in the face of droughts at community level.

## 3.4 Data analysis techniques

Decadal and monthly data, semi-structured and structured interviews, observation and the focus groups used in the implementation of the PVCAs and the generation of the CSIs helped inform this research on pastoralists' current and past vulnerability to drought, conditions of living and recent rainfall patterns. Constant retroactive analyses were done with information triangulation to search for common trends and deviations in findings to ensure continuity in the analysis throughout the thesis and to limit any potential contradictions in the results. The ethnographic data, and PVCA and CSI responses from the questionnaires were regularly reviewed with the communities by the investigative team and myself to check for incongruity in statements. Qualitative and quantitative data were analysed through the use of software such as Excel, SPSS and NVivo. Topographic observation, review of available records and interviews with key players before and after evaluations were conducted in the village. This combination is a particularly balanced and qualitative analysis with respect to the contribution of the community.

*i. Microsoft Excel: generation of meaningful tables and graphs*

Microsoft Excel was useful in the arrangement of decadal and monthly rainfall data. More particularly, it was used for the performance of simple statistical tests and the generation of tables, graphs and pie charts for rainfall, CSIs and funding data.

*ii. QSR NVivo: making sense of qualitative data*

This software helped me organize the qualitative data obtained through fieldwork as well as all the side notes taken through many readings of articles, books, reports and notes acquired as part of my bibliographic research and secondary data search. The main strength of the program was that multiple formats of information could be organized according to specific chapters, themes and sections discussed in the thesis. In addition, with regards to qualitative data analysis, the software helped me to extract correlations and differences in drought perception between respondents. It was a powerful tool for classifying qualitative data to establish relationships between different elements of influence.

*iii. SPSS: quick and simple statistical package tool*

This software was particularly useful for performing a range of statistical tests on quantitative and qualitative data. These included normality tests to determine the use of parametric or non-parametric statistical tests, frequency tables, Pearson and Spearman's correlation tests, variability coefficients, homogeneity of variance tests, parametric and non-parametric Levene's tests for comparison between variances, analysis of variance (ANOVA) and Kruskal-wallis tests for comparison between non-parametric means.

## 3.5 Conclusion

Firstly, the chapter reviewed the origin of the post-structural approach chosen for this study as well as the surrounding debates about possible alternative approaches which were considered but not selected. In addition, it discussed the methodological implications of the geographical approach on fieldwork, including scalar considerations specific to the study of the production of vulnerability to drought.

Secondly, the chapter delved into the nuts and bolts of fieldwork in rural Djibouti for the generation of primary data and the collection of secondary data. As mentioned, a variety of techniques were used which included semi-structured and structured interviews, ethnographic work and focus groups, especially for the implementation of the PVCAs and the generation of the CSIs. It also presented some of the constraints inherent to the social-cultural environment of the study sites and logistical challenges.

The results obtained through this methodological process are presented in Chapters Four, Five, Six, Seven and Eight. The following chapter discusses the practice of pastoralism in East Africa and its disruption as part of the historical root causes of vulnerability during the colonial period in Djibouti.

# 4 Colonizing a pastoral commons

## 4.1 Introduction

This chapter first investigates the origins of pastoralism and the different ways in which it is practised in the arid and semi-arid lands (ASALs) of the Horn of Africa. It also describes and discusses the social-environmental relationships proper to livestock rearing in a non-equilibrium environment and the different adaptive mechanisms traditionally adopted by pastoralists to preserve their livelihood.

The aim of this chapter is to address the first research sub-question from Chapter One:

- What are the root causes of change in the pastoral landscape responsible for giving rise to vulnerability in rural areas of Djibouti?

To answer the aforementioned sub-question, the concept of pastoralism in East Africa is firstly discussed. Secondly, the chapter introduces the people under study known as the Afars and Somalis as well as their traditional nomadic way of life in the pre-colonial period. Thirdly, the chapter discusses the events which occurred during the colonial period and explores the progressive appearance of root causes of pastoral vulnerability to drought. In particular, it revisits the forces of environmental change behind land partitioning, fragmentation of pasture lands and the containment of nomadic groups within borders in what will become Djibouti.

## 4.2 Conceptualizing and understanding pastoralism

In the ASALs of the Horn of Africa, livestock mobility or herding is a practice that is integral to pastoral livelihood systems. A product of the harsh conditions in which it was born, livestock mobility is a strategy that permits pastoralists to transform crop residues, herbs and grasses of lands too hostile for agricultural production into human food. Livestock need to have regular and continuous access to nutritious pasture throughout the year in areas of "marked seasonality" and irregular plant growth that is dependent on both temperature and rainfall

(Dyson-Hudson et al. 1980). However, livestock husbandry associated with mobility for exploitation of seasonal pastures is not the only reason why pastoralists move with their herds. Livestock being their major source of subsistence, movement allows them to counteract a whole series of risks that are physical and social in nature and different from those faced by "agricultural people who are [rather] tied to their agricultural lands and their stored agricultural products" (Dyson-Hudson et al. 1980). This section uncovers how environmental determinism operates in defining pastoral societies and associated risks.

### 4.2.1 Defining pastoralism

Pastoralism is the main livelihood system found in the arid and semi-arid lands (ASALs) of the world. It is characterized by the use of rangelands for livestock production. Supporting 100-200 million pastoralists globally (Ouma et al. 2012), 50 million of which are in sub-Saharan Africa, 31 million in West Asia and North Africa, 25 million in Central Asia, 10 million in South Asia and 5 million in Central and South America (Krätli et al. 2013), this mobile system of living is one of the most important economic activities found in the Horn of Africa. In 2001, the Food and Agricultural Organization (FAO) of the United Nations (UN) reported that pastoral systems alone covered a quarter of the world's land area and provided 10% of global meat production (Meier et al. 2007). Moreover, they are reported to occupy 70 percent of the total land of Kenya, 50 percent of Tanzania and 40 percent of Uganda (Fratkin 2001b) for livestock production while their proportion with regards to the total population in their respective countries is rather variable. For instance, out of the total population, pastoral and agro-pastoral population comprise about 60% in Somalia, 33% in Eritrea, 25% in Djibouti, 20% in Sudan and 12% in Ethiopia (Coppock, 1994, quoted in Ouma et al. 2012).

There is a wide variety of viewpoints for the definition of pastoralism. It can be described as a type of production strictly based on animals (means of production) or a type of livelihood configuration which includes a variety of productive strategies, social relations between groups for the exploitation of the land's resources and their reproduction (Abdi 2003). The absence of a unified and/or universally agreed upon definition of the term is linked to differences in livestock use, degree of dependence on herds and movement patterns of those populations. Some definitions of pastoralism are proposed in Table 4.1.

**Table 4.1 Definitions of Pastoralism/Pastoralist**

- ***Pastoralism:*** "consist of people who either: (i) raise livestock for consumption; (ii) raise livestock mainly for trade or social exchange; or (iii) both" (Jacobs 1965)
- ***Pastoralism:*** "[is] a kind of economy where subsistence on livestock is the most important economic activity" (Widstrand 1975)
- ***Pastoralists:*** "are people whose livelihood depends mainly on the raising of domestic animals including cattle, camels, goats, sheep, and donkeys, which are used for milk, meat, transport, and trade" (Fratkin 2001b)
- ***Pastoralism:*** "is a subsistence (economic) pattern in which people make their living by tending herds of large animals" (Kandagor 2005)
- ***Pastoralists:*** "keep a significant part of their wealth in form of livestock" (Ouma et al. 2012)
- ***Pastoralists:*** "according to Swift (1988), [they] are households where more than 50% of the household income/consumption is derived from livestock or livestock related activities, either as a result of sales of livestock products or of direct consumption [...]" (Eneyew 2012)
- ***Pastoralists:*** "can be viewed as being in the business of producing animals [...]" (Næss 2012)
- ***Pastoralism:*** "is defined by a specialization to take advantage of the characteristic instability of rangeland environments" (Krätli et al. 2013)

*Source: Author's research*

In addition, further subdivisions within pastoralism itself also exist. For instance, when analysing the Somalis' livelihood system, Jacobs (1965, p.146) divides pastoralists into two branches: pure pastoralists and semi-pastoralists. He described them as follows:

- ***Pure pastoralists***: "practise no agriculture and raise livestock for food consumption and internal social exchange, and are relatively free from external trading or market situations".

- ***Semi pastoralists:*** "although chiefly herders, [they] raise livestock mainly for exchange purposes while subsisting primarily on agricultural foods, and [...] are thus dependent on external trade and markets[9]".

Moreover, he argued that pure pastoralists tended to be "less nomadic in their herd and household movements than semi-pastoralists, yet more egalitarian in their social institutions and more loosely organized politically. They lack ranked systems of social class and centralized forms of political organization, institutions which abound among the semi-pastoralists" (Jacobs 1965, p.147). Based on Jacobs' two definitions, different forms of

[9] Further distinctions within semi-pastoralism can be found in Jacobs (1965).

ecosystem services exploitation, environmental drivers of livelihood systems and associated impacts and differences in dietary intake of various foods are thus anticipated.

There is no general classification of the different forms of pastoralism. Various researchers postulated different classes of pastoralism driven by several criteria ranging from distance covered by pastoral migration, herd/species composition, herd management systems labour organisation and others (Hassen 2008). According to the literature, there are three pastoral systems that can be distinguished based on the degree of dependence on livestock products for household consumption and the importance of various agricultural/foraging activities. These are nomadic pastoralism, transhumance pastoralism and agro-pastoralism which are respectively described here below.

*i.* Nomadic pastoralism*:* Derived from the Greek word *nomados* which means 'living on pasture', there has been a progressive shift of emphasis from 'pastoralism' to 'movement' in its definition. Indeed, whether it is in common language or in the literature, 'nomadism' generally refers to continual movement of people and herds[10] (Salzman 1967, Galaty 1989). According to Salzman (1967) it is "a way of life at least partially based upon movement of people in response to the needs of their herds and flocks". Behind this definition, it must be realized that studies of mobile livestock herders have fallen short in proposing any coherent theory of nomadic pastoralism as it is not a 'unitary phenomenon' nor a 'single form of adaptive response' to environmental fluctuations (Dyson-Hudson et al. 1980). Social and spatial behaviours of livestock herders are contingent upon prevailing socio-environmental and political conditions and are known to find their strength in exploiting the flexibility offered by their livelihood system.

*ii.* Transhumance pastoralism*:* As indicated by the definitions shown in Table 4.2, this livelihood system is characterized by regular seasonal movement of a portion of the people with their herds while the rest of the population is spatially fixed and complement any needs through activities associated with a sedentary way of life. Hereafter is a non-exhaustive list of definitions of transhumance systems of livestock exploitation.

[10] A table of criteria for defining nomadism can be found in Salzman (1967).

**Table 4.2 Definitions of Transhumance/Transhumant**

**Salzman (1967)'s definitions:**

- ***Transhumance:*** "[is] applied usually to semi-sedentary or seminomadic peoples who move vertically into the mountains during the migratory season" (Bacon, 1954 p. 44)
- ***Transhumance:*** "[is] regular seasonal movement of cattle, southward in the dry season in response to shortages of pasture and water, northward in the wet season to avoid tsetse" (Stenning, 1960 p. 145)
- ***Transhumance:*** " [corresponds to] movement in mountain regions (where) different levels in the same district are occupied successively [and] is more a change in altitude" (Fisher, 1963 p. 122)
- ***Transhumance:*** " [is when] the cycle of movement is an annual one and follows the seasons, rather than a longer one requiring several years ... annual movement between village and cattle camp is the most striking characteristic of the technology of societies that practice transhumance" (Bohannan, 1963 pp. 214-215)

**Other definitions:**

- ***Transhumant:*** "is now [...] used to describe short, seasonal movements of animals, under the care of herders, between permanent homestead and permanent outlying summer pasture" (Widstrand 1975)
- ***Transhumance:*** "[is when] animals [are] moved long distances in the course of the year" (Nugent et al. 1993)
- ***Transhumant:*** "maintain permanent settlement while the herders move their livestock seasonally in order to exploit areas away from the permanent settlements" (Abule et al. 2005)
- ***Transhumance:*** "[corresponds to] seasonal movements of herds and flocks accompanied by herdsmen along more or less fixed trekking routes to wet season grazing areas returning to their sedentary base where the rest of the families live permanently in the dry seasons" (Bourgeot, 1994 p. 69 quoted in Gomes 2006)

*Source: Author's research*

Based on partial settlements, it has been noted that nomadism is more efficient in terms of productivity measures (performance) than sedentary livestock systems and transhumant systems (Krätli et al. 2013). 'Herd splitting' is very characteristic of transhumance with most animals being taken away for grazing while others (especially those that are lactating, weak or used for working purposes) are rather kept at the homestead (Hassen 2008).

*iii.* Agro-pastoralism*:* This mode of subsistence corresponds to permanently settled pastoralists who primarily engage in agriculture for their daily survival. As indicated by Krätli (2013, p.47), "agro-pastoral systems [...] often combine within the same household specialised farmers and mobile specialized pastoralists, and therefore maintain livestock-crop integration also the regional scale". As their major economic activity, this pastoral system relies heavily on crop production and therefore its practitioners invest much effort and financial capital into fixed/stable structures such as housing and infrastructure.

Although these definitions do inform us on the variety of pastoral systems, one central point which determines the eventual denomination of the livelihood has to do with the extent of direct dependence upon livestock and the source of stock and pasturage, which do vary from group to group. For instance, pattern of movement that is seasonal versus full-time displacement of people and herds within one altitude range has been emphasized in the literature in discriminating nomadism from transhumance (Salzman 1967).

However, although there is some correlation between the two criteria as it is observed with the Zagros nomads (seasonal movement and change of altitude, i.e. transhumant) and the Bedouin of Arabia (full-time movement and no change in altitude, i.e. nomad), this is by no means generalized. For example, the Fulani and some of the Bedouin of Cyrenaica have important seasonal migrations with little change in altitude and the Baluchi move more or less constantly although through different ranges (Salzman 1967, Fratkin 2001b, Little 2003). The flexibility of a pastoral system therefore disinvites strict categorization of specific modes of subsistence in the ASALs since pastoralists constantly adapt it to accommodate environmental fluctuations in space and time. As such, we need a better understanding of these adaptive measures to better appreciate pastoral livelihoods' close relationship with their surrounding environment. The following sub-section presents and deconstructs pastoral livelihoods.

### 4.2.2 The pastoral political economy

The political economy of pastoral societies in the Horn of Arica is characterised by livestock herding on common property lands, by individual ownership of livestock and by the lack of a strong State. Given the remarks made above about pastoralists consistently wanting to achieve ever-increasingly large number of herds as a precautionary measure against sudden stresses or shocks and the fact that land is considered as common property in the ASALs, the lack of incentive for land preservation justifies any anticipation from analysts that such a system may eventually lead to the tragedy of the commons (Garrett 1968), that is over-exploitation and destruction of the land. Indeed, according to tragedy theorists, the lack of a strong State overseeing land use and imposing strict regulations over collective land use might translate into weak and inappropriate property rights. However, if one scrutinises pastoral systems more closely, its features do not necessarily lead to such destructive effects.

On the contrary, traditional pastoral common property systems are "an effective response to economic circumstances" coherent with the environmental context (Ensminger et al. 1991). In itself, the common property system that permeates pastoral societies of the Horn of Africa emerged from the peculiar ecological features of the ASALs. Characterised by erratic and unpredictable rainfall patterns in time and space, a small confined topographical space of land in this region cannot support livestock herds on the long term. Common property rights does not invite strict imposition, regulation and monitoring that private property rights do over small delimited parcels of lands. Of course, these benefits do not explain how such traditional systems subsist without leading to tragedy (Ensminger et al. 1991). Such an explanation is found through examination of the pastoral production process and the environmental context within which it takes place. Among the limiting factors of livestock production, the availability, accessibility and quality of pasture lands and water are paramount. As correctly indicated by Ensminger and Rutten (1991), "stocking levels will depend in part on the cost to the pastoralist of each of the inputs". Not only that, "the marginal cost of inputs depends on property rights". This means that if property rights could be imposed on one of the inputs, then the cost of using it could be raised enough to prevent overusing environmental resources such as the land. If this is so, then it is indeed possible to rationally attribute common property rights to land. In effect, "some resources belong to individuals, others to lineages or tribes, and still others to everyone; some are usufruct, some leasehold and some freehold" (Ensminger et al. 1991). In addition, a society with movement or mobility as a central livelihood component in an environmental context characterised by severe aridity periods and/or epidemics requires functional land tenure, rules that govern the use of resources during emergencies and access arrangements to be established (extended social capital) (Ensminger et al. 1991, Krätli et al. 2013).

Nugent and Sanchez (1993) have identified five main benefits out of the multiple uses of livestock which are central to the pastoral political economy in the ASALs. As shown in Table 4.3, these benefits are associated to five key characteristics of pastoralism which include productivity, mobility, sustainability, extensive use of the land and protection from hostility. These benefits must not be seen as mutually exclusive as in reality these features are inter-related and influence one another. Together, these characteristics translate the sustainable flexibility and therefore adaptability of the pastoral system with its fluctuating environment.

**Table 4.3 Advantages of pastoralism in the ASALs of East Africa**

| |
|---|
| 1. ***Productive***: Cattle, sheep and goats provide meat products, dairy products, bone products, blood, animal oil, fat, textiles (wool, hides, and skins), fuel (dung) and others for auto-subsistence or marketing (Nugent et al. 1993). |
| 2. ***Mobile***: Movement and dispersed transhumance prevent infection, sickness and mortality in both humans and animals. Animals are healthier, stronger and more adaptive to environmental fluctuations when they move than when they are sedentary (Nugent et al. 1993, Krätli et al. 2013). |
| 3. ***Sustainable***: ASALs yield greater and more durable pasture when their maximum carrying capacity is respected through constant movement and mobility of animal herds rather than sedentary and continuous animal husbandry[11] (Behnke 2000). |
| 4. ***Extensive***: Pastoralists reduce risk due to water scarcity by ensuring access to the largest possible grazing area (Simel 2010). |
| 5. ***Protective***: Exposition to conflict and raiding can be minimised through mobility of assets, that is majorly livestock in this specific case (Mkutu 2001, Meier et al. 2007). |

*Source: Author's research*

### 4.2.3 Social-environmental relationships

Since the 1940s, there has been recognition that nomadic pastoral systems cannot be studied and understood without a socio-environmental outlook at the physical and biotic environment that influence the spatial and social organisation of pastoral societies. Cultural ecologists, who "are concerned with interrelations between organised human behaviour and the material world" have interpreted the appearance of pastoral social constructs as a product brought about by a set of adaptive responses to specific characteristics or features of the natural environment simply because they have been observed to occur (Daryl Forde, 1970 quoted in Dyson-Hudson et al. 1980, p.25).

If Torry's study of Gabra residence rules (1976) is taken as an example, it exhibits a period of "uxorilocal postmarital residence" which eventually results in a strong dependence on affinal ties for successful durability of household livelihoods, which is different from those of the Maasai, Somali, Karimojong, Samburu and Turkana. In addition, contrary to their neighbours, the Gabra breed large numbers of three kinds of livestock which are cattle, camels, and small stock (Torry 1976). As seen earlier, each animal exhibits specific temporal and spatial needs that need to be satisfied by their environment in terms of pasture and water consumption. According to Torry, the relationship between the management of multiple herds (which is a feature of the material world) and the specific social organisation of the Gabra (an uxorilocal

[11] A more in depth conversation about equilibrium and non-equilibrium systems can be found in Chapter Two, section 2.2.3 of the thesis.

residence requirement) permit this pastoral system to function. He suggested that these multiple simultaneous incompatible requirements were satisfied thanks to the large Gabra system of tribally and affinally constituted groups of herders (Torry 1976). However, these relationships described by Torry were absent and not supported by other studies of the Turkana who also herded camels, cattle, and small stock without having uxorilocal residence rules (Dyson-Hudson et al. 1980).

Nevertheless, this does not invalidate the general hypothesis that there is a relationship between social organisation and the demands of livestock herding. Understandably, this hypothesis is very difficult to test due to difficulty in evaluating the extent to which information collected about the social organization of pastoral nomads represents true statements about the ideal social order rather than the actual/current relationships that are taking place (Dyson-Hudson et al. 1980). In continuation with the previous paragraph, a socio-ecological relationship analysis requires a detailed study of both animal and human behaviour in order to account for causal linkages between the physical and biotic environment and the social configuration of pastoral societies.

### 4.2.4 Adaptation to environmental fluctuations

Pastoralists' livelihoods, behaviour and survival strategies are very responsive to climate fluctuations since the very basis supporting their livelihoods is contingent upon environmental conditions (Luseno et al. 2003). We cannot emphasize enough the importance of both natural and social systems in understanding the pastoral way of life. The ASALs are characterized by poor land quality, low population density (hence labour scarcity), the use of simple technology and extreme seasonality combined with yearly fluctuations in rainfall and production. These characteristics imply that land is of low value compared to equilibrium environments, private property rights do not exist and means of transportation are such that they limit access to markets and reduce products to be traded in size and quantity while exposing it to relatively frequent supply and price fluctuations due to local and/or far-flung weather changes (Nugent et al. 1993). Less normative, it is the author's view that land cannot be objectively defined and studied from a point of view tainted with western preconceived notions about what a good input should look like based on other more familiar functioning systems (agriculture). Words such as 'poor land quality', 'labour scarcity' and land that is of 'low value' are statements that

subjectively define pastoral systems. If pastoral systems do survive and have long been in existence in that part of the world for millennia, then it must mean that the system is indeed 'viable' the way it is. Thus, land quality, labour and its 'value' are aspects that are better assessed and judged in an immanent way, without any external frame of reference. From an external point of view, the exercise is informative but does not always reflect the beliefs and values about land and labour that are embedded within the system.

Due to the fact that livestock is range-fed and grain fields are usually non-irrigated, rainfall is a major determinant of year to year variation a household may experience in both crop and livestock yields (Mace et al. 1993). Mace and colleagues have set up a model to investigate decision-making processes of subsistence-oriented herders and farmers in pastoral and agro-pastoral systems in order to identify which strategies they should adopt to minimize the probability of falling into poverty traps. In this experiment, "survival" simply means not running out of food. Based on this premise, the study found that pastoralists increased chances of long-term survival by taking up agro-pastoralism if wealth was less than a certain level. In continuation, when agro-pastoralists became wealthy enough, they would give up cultivation for herding (Mace et al. 1993, Fratkin 2001b). This exhibits how pastoral systems are adaptable to environmental fluctuations depending on household needs and explains the difficulties found in giving clear-cut definitions of pastoral systems. If certain environmental variables such as rainfall, accessible water or pasture decrease or, inversely, if other variables such as household needs or costs of living increase, then adaptation can manifest itself through a shift from pastoralism to agro-pastoralism. The nature of livelihood is still pastoral but includes some agriculture for a certain period of time until wealth increases again, in which case, they shift back to pastoralism (Mace et al. 1993).

Although highly adaptable, pastoral systems are by no means immune to insecurity and risk. Barret et al. (2001) define 'risk' as " exposure to uncertain and potentially unfavourable consequences, and use both 'risk' and 'hazards' synonymously". This is an excellent opportunity to reemphasize the definition of risk that has been chosen for this project in Djibouti. Contrary to Barret et al's definition, this thesis views disaster risk as a "compound function of the natural hazard and the number of people, characterised by their varying degrees of vulnerability to [a] specific hazard, who occupy the space and time of exposure to the hazard event" (Wisner et al. 2004, p. 49). According to this definition, drought is a hazard and its combination with various elements of vulnerability embedded in pastoral livelihood systems

can then turn the product of this combination into a type of disaster, being extreme food insecurity, severe malnutrition or even famine. As such, this study is concerned with investigating various factors of vulnerability responsible for increasing the 'risk' of food insecurity or famine in the ASALs.

In economic terms defined by the western world, pastoralists are indeed poorer and more food insecure than their highland, humid, sub-humid counterparts. They tend to be less literate and have less access to public infrastructure, services and nowadays depend highly on food aid which was not the case just over a century ago (Barrett et al. 2001, Eneyew 2012, Headey et al. 2012, Krätli et al. 2013). Transhumance is also exposed to insecurity with livestock being targeted by raiders, thieves and outlaws who have the possibility of moving freely, especially close to borders in region. In addition, bearing in mind that there is crucial lack of statistical time series of direct relevance to ASAL 'residents' in comparison to agriculture (Smith et al. 2000, Jury 2009, Kelemework Tafere Reda 2012), nomads are both exposed and at a higher risk of asset loss due to natural extremes such as droughts, fires, floods, cold weather, or pest infestations which are known to have "wiped out as much as half the animal stock in whole regions within a single year" (Nugent et al. 1993, p.90).

During droughts, herdsmen are forced to deplete their livestock in favour for cash to purchase grain for the remaining animals and themselves during which terms of trade of meat for grain will tend to drop precipitously. Whereas agriculture can rebound quite rapidly within a year, herd repopulation necessitates a lot more time, the maximum rate being equal to the natural multiplication of the herd (Nugent et al. 1993, Krätli et al. 2013). They may suffer from water and/or food scarcity, human disease and lack of transportation, with a higher vulnerability level for the poor than for the wealthy. Given that men's risk perceptions are different from women's as they are assigned different roles within the household, there is a positive correlation between asset poverty, vulnerability and food insecurity (Barrett et al. 2001). Finally, scarcity is known to increase competition for resources (higher probability of overgrazing) and the likelihood of conflict between different nomadic societies but not necessarily within homogenous pastoral groups contrary to what is believed by some (Simel 2010). Often, the result of complete loss of asset, as seen in the Djiboutian context, is definitive long-term sedentarization of entire pastoral groups in what Smith et al call "pastoral towns" (2000).

## 4.3 Introducing the people under study

### 4.3.1 The Afars

The Afars, also known as the *Danakil* or *Dankali*, are found in present day Ethiopia, Eritrea and Djibouti. The Afars are composed of two groups: the *Adohyamaras* ('white men'), living on the coast, in the 'Sable Blanc' (white sandy soil) region which comprises the Sultanates of Raheita, Tadjourah and the Gobaad, and the *Asahyamaras* ('red men') who inhabit the region inland where the soil has a reddish color, such as in the Kingdom of Aoussa. Table 4.4 shows that the main Afar nomadic tribes found within the boundaries of Djibouti are split between these four traditional zones mentioned here below.

**Table 4.4 The main Afar tribes of the Republic of Djibouti**

| Traditional zones | Tribes |
|---|---|
| Sultanate of Tadjourah | Adali (or Adael), Hassoba, Able, Airolasso, Songo Goda, Maanditta |
| Sultanate of Rahaito | Bassoma, Konyely-boura, Badoita-mela |
| Ex-Sultanate of Gobaad (Debné Chiefdom) | Debné, Adorassoul |
| Kingdom of Aoussa | Oloto-k-Madima, Gombar, Ablissa, Oloto-k-Modaito, Wandaba, Galaela, Adkalto |

*Source: Oberlé and Hugo, 1985, p.35*

Among the Afars, the importance of certain tribes over the others is determined by their origin and the presence of a connection with one or more prestigious ancestors. For instance, the Sultan and Vizir of the Sultanate of Tadjourah regularly hail from the Bourhantos and the Dinittes clans of the Adali Tribe. The Afars submit to the rigorous discipline of the *'fi'ma'* , a council of notables which regulates all aspects of life. The tribal Chief, trusted and respected, presides on ceremonies, rituals, especially in times of drought as he is in charge of bringing the rain (Oberlé et al. 1985, p.36, Coubba 1993, p.47).

As shown in Table 4.5, Afar society can be organised according to three different types of social and political organizations spread out over different geographical zones. Among the different political organizations, each Afar tribe owns land, a fief, a territory geographically delimited as part of a sultanate or tribal 'chiefdom'. That territory is known as a collective

historical heritage of immense social value to the Afars. The tribal land is then further divided among the families of that tribe. One can rent it, with compensation, to other groups.

**Table 4.5 Afar territories in Djibouti**

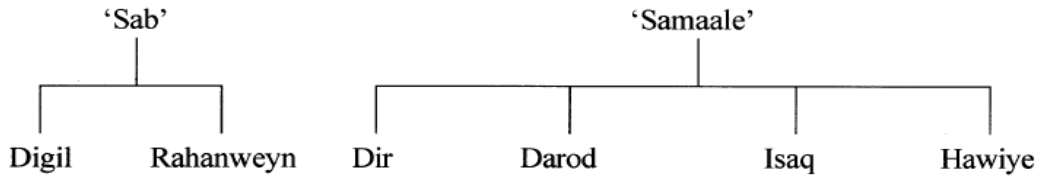
| Organizational Type | Territory | Characteristics |
|---|---|---|
| Sultanate | -Tadjourah (entirely part of Djibouti)<br>-Rahaito (two-thirds part of Djibouti)<br>-Gobaad (mostly part of Djibouti) sometimes referred to as the Debné Chiefdom | -Leader is a *Dardar* (Sultan), aided by a *Banoita* (Vizir)<br>-Sultan is more symbolic than authoritative, collects taxes |
| Kingdom | -Aoussa (great portion of it contained in Djibouti) | -Leader is an *Amoyta* (King)<br>-King with absolute power on his subjects<br>-Feudal, strong centre of power |
| Chiefdom | -Debné (also called Sultanate of Gobaad) | -Leader is a Supreme Chief<br>-Inhabited by the Debné and Adorassoul<br>-Great solidarity and collective values |

*Source: Re-adapted by the author from Thompson and Adloff, 1968, p.24-25, and Oberlé and Hugo, 1985, p.18*

### 4.3.2 The Somali-Ise

The Somalis are spread out between present-day Somalia, Djibouti, Ethiopia and Kenya (Figure 4.2). There are seven main Somalis groups (or tribal-families) which are the Ise, Gadaboursis, Isaq (or Ishaaq), the Darods, the Hawiyes, Dir, Digil and Rahanweyn (Sab).

**Figure 4.1 Somali 'family tribes'**

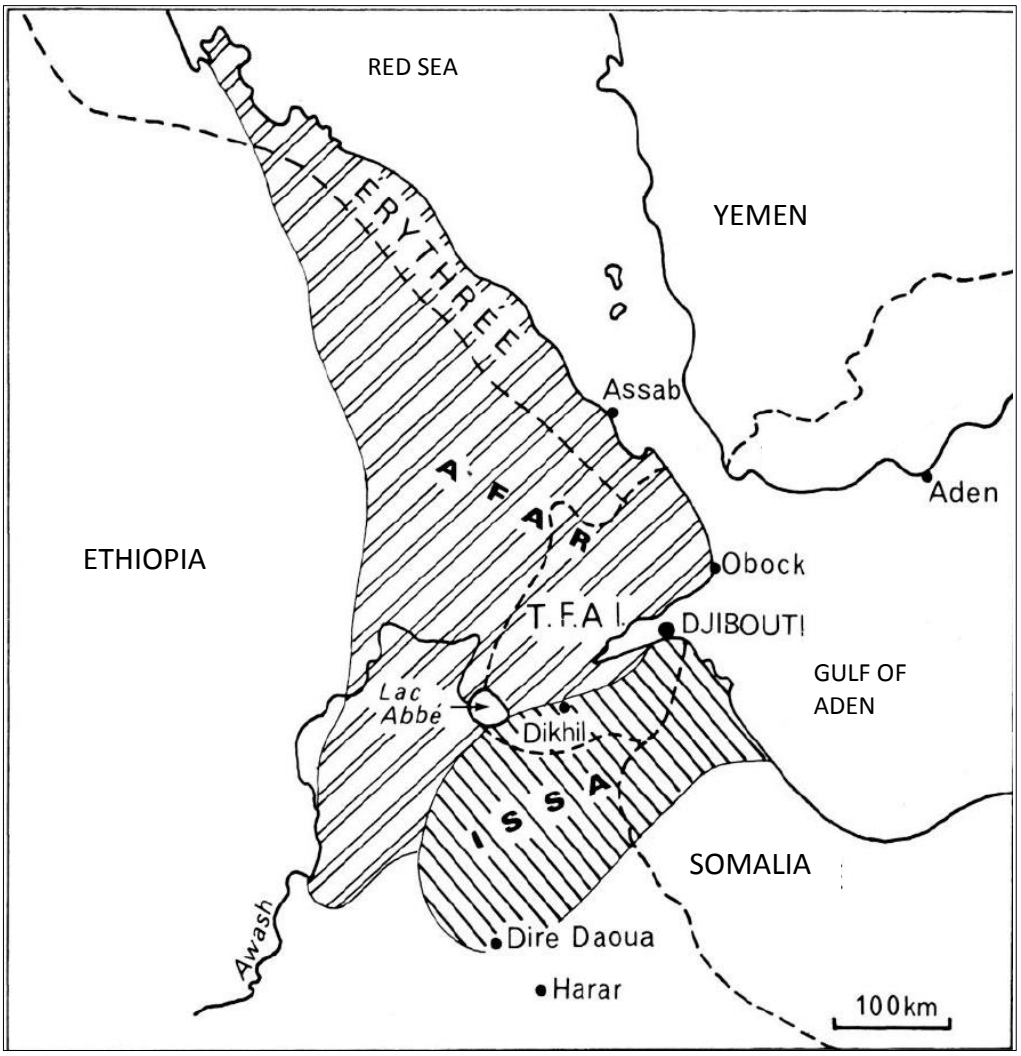



*Source: Lewis, 2004*

The first and highest-level distinction between the 'Samaale' and the 'Sab' shown in Figure 4.1 has to do with cultural and linguistic differences. In addition, the Samaale are nomadic pastoralists while the Sab are agro-pastoralists. The latter are found in the fertile area between Shebelle and Juba rivers, in present-day Somalia and speak a dialect of Somali called 'May'. Of the main seven groups, the Digil and Rahanweyn and the Isaq concentrated in what became British Somaliland (today the 'Somaliland Republic') while the Darod and Hawiye have

regrouped in what became successively the Italian colony of Somalia, independent Somalia (including Somalia) the 'Democratic Republic of Somalia'(under military rule) and present-day Somalia (excluding Somaliland, but including 'Puntland' formed out of an alliance of the Darod clans) (Lewis 2004). As shown in Figure 4.2, Somali-Ise territory extends from the South-Eastern part of Djibouti to Zeila to the south and to Dire-Dawa to the West. They are the main original Somali group which found itself contained within the boundaries of the Republic of Djibouti when the area was occupied and colonized by the French at the end of the 19th Century.

**Figure 4.2 Distribution of the Afar and Somali-Ise population at the time of the *Territoire Français des Afars et des Issas* (TFAI) (1967-1977)**

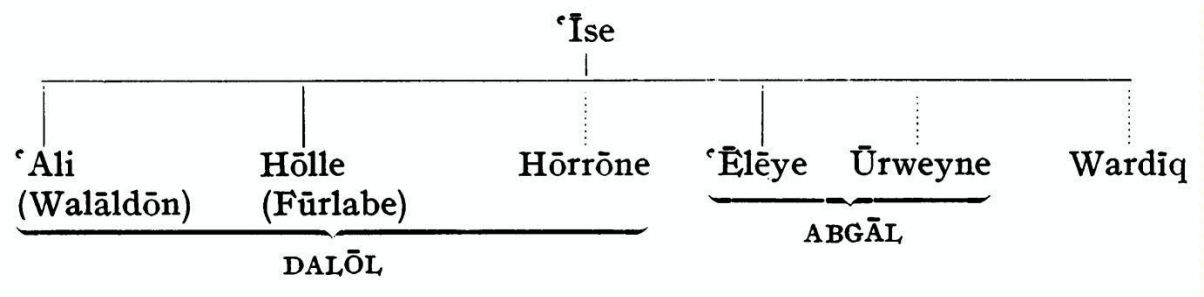



*Source: Charpin and Georget, 1977*

The Ise are constituted of two main groups: the Dalol and the Abgal (Figure 4.3). According to Oberle (1985), the Abgal group comprises the Rer Mousse, Mamassan and Ourweine while

the Dalol group comprises the Walaldon, Fourlaba and Horone. The Wardiq stand alone and belong neither to the Dalol nor Abgal groupings. Rather isolated and known to be the smallest Ise lineage in number of descendants, the Wardiq have a unique political role among the Ise clans in that the Ise tribal head, known as the 'Ugas', traditionally hails from that clan (Lewis 1961, Oberlé et al. 1985, p.40, Coubba 1993, p.44, 111).

**Figure 4.3 Somali-Ise clans**




*Source: Lewis, 2004*

The Wardiq are believed to be endowed with blessing (Baraka) by 'virtue of which they fulfil a mediatory role in relation to the other Ise lieanges'. The *Ugas* is more of a 'peace-maker, concerned with the maintenance of internal peace and cohesion […] and with the general well-being and prosperity of his tribe'. It is believed that he can make it rain if needed in case of a drought. He lives near Dire-Dawa in Abyssinia (present-day Ethiopia). In spite of all these divisions between the different Ise clans, all the Ise have a very strong common sense of tribal identity in relation to outsiders (Lewis 1961).

There is no specific definition of charges and/or functions formalizing positions of power and authority among the Somalis. There are internal and local social dynamics which, under the influence of external factors (market penetration strategies, colonial and postcolonial state power, etc.) contributed to recomposing the political landscape of local people. As rightfully indicated by Djama (1997), the absence of a residential base in setting up formal political linkages stems from the nature of local pastoral life and, by extension, from the ecological conditions found in Northern Somali zones. These conditions have forced indigenous populations to engage in a form of transhumance that is irregular and fluid due to the unpredictable behaviour of rainfall. Such environmental conditions disinvite private and collective property mechanisms in the use and management of pastoral resources, especially pasture land and water. The unpredictable nature of climatic variables can (and does) prevent stability and capital accumulation. Natural checks on livestock numbers and social processes

(conflict, customary exchange of livestock, raiding, and marital/funeral rites) often redefine social stratifications and power relationships between pastoral groups.

### 4.3.3 Sustainable societies in a hostile environment

As seen above, the Afar and Somali societies are traditionally segmented in similar ways: the people, the tribe, the clan and the sub-clan (or grouping). The fundamental basis of the unit is the tribe around which the social identity of every individual is defined: its position, the historical specificities of the group they belong to and the location of their ancestral territory. The extended family, supported by multiple agnatic ties, forms the basic economic nucleus (Oberlé et al. 1985, p.15). The most essential function of the *reer* and *buxa*[12] is to be a residential, production and consumption unit based on kinship and agnatic ties. Each group is subdivided in a number of families and/or sub-groups of variable importance and closeness depending on geographical proximity and parental sharing. These parental connections and ties are the ones that predominate and determine the nature of relationships between people so much that distance does not necessarily affect the closeness of two tribes or families that are geographically apart.

These traditional values and societies are maintained through marriage and exchange of livestock. These Cushitic people of the East are mainly pastoralists, rearing dromedaries, cows, goats and sheep. To these people, livestock is more than just the basis of a livelihood. It is a central, tangible entity that structures connections, beliefs and nomadic mentalities. Livestock are cherished, sung, protected, celebrated and are the source of wealth in this 'prestige system'. In these pastoral societies, wealth is determined by the numbers of the principal animal herded (Konczacki 1967, Sheik-Abdi 1977, Oberlé et al. 1985, p.15). The animals were regularly shared and donated between families (Sheik-Abdi 1977).

The fragility of livelihoods in this harsh environment determines the development cycle of families which is well controlled by rites and traditional institutions. Children and young adults stay with their families until they marry and, above all, until there is enough extra livestock to allow for their separation from the family. However, this separation does not mean that social

[12] *Reer* and *buxa* is the name given to the domestic group in Somali and Afar language, respectively.

contact is stopped between the departing member and his family. Even if they stop interacting, kinship recognition does survive through agnatic ties.

As has been seen, a nomadic society (whether it is Afar or Somali) is not based upon relationships between borders and power, but rather upon regular displacement and movement. If there are any nomadic 'borders', then these delimit transhumance axes which are not necessarily set in stone as they are constantly negotiated and re-negotiated. Therefore, these boundaries cannot be mapped. However, colonisation brought in a totally new reality where nomads were confronted with multiple forms of borders: national, administrative, traditional. The nature of these interactions is analysed in the next section.

## 4.4 Partitioning of a pastoral land

According to Sheik-Abdi (1977), Richard Burton was the first westerner to penetrate the Somali interior, although multiple past unsuccessful attempts had been made. At the time, indigenous property rights over land depended very much upon socioeconomic, political and natural conditions; they adjusted over time in response to changing opportunities or demographic changes. In addition, property rights were not always clearly defined in terms of access and use of the land. They could change depending on the people, the tribe or the clan. When the first explorers arrived, traditional property rights systems were not acknowledged and the fact that they were not fixed and precise in western terms of ownership rights facilitated the land acquisition process by the French. In this sub-section, the impacts linked to the creation of boundaries and partitioning of the land on the nomads and their reaction to it is examined.

The Berlin Conference of November 14$^{th}$ 1884 formally declared the partitioning of Africa between the various European powers. Economic motives included the need for primary goods and the increase in trade encouraged the effective colonisation of previously neglected locations (Coubba 1993, p.53). In the case of the French, they were in dire need of a port where they could revictual their ships en route for Rada and Indochina. Treaties were signed between the French and the Sultans of Tadjourah and Rahaito, as well as the Debné Chief. Unfortunately, as it happened so frequently across Africa at this time of colonization, the indigenous, illiterate and defined by their strongly oral traditions, did not comprehend the

importance and legal significance of the treaties being signed which established rules and borders on the land. Thus the Sultans were persuaded to cede the potential anchorage of Obock and the coastal band stretching from Ras-ali to Doumeira in exchange for a payment of 10 000 ‘thalers’ but with no realisation that this meant a permanent transfer of control of that land.

This treaty, including those that followed, was in contradiction with the traditional rules that governed the use and management of indigenous land. They disregarded local population dynamics, the workings of traditional pastoral life based on land and livestock and the opinions of rural households living on the land. As it is indicated in Table 4.6, not only were rural households not consulted, they were not even mentioned in the texts when in fact, they have been living on these ancestral lands for centuries. Borders were drawn according to convenient markers linking certain known points based on reviews made by explorers with no prior knowledge and interest in the existing property rights system that was in place.

Among the Afar, property rights were based on the traditional pastoral vision that land belonged to community members defined by sanguinity or other social ties (Hundie 2006). The *wano* or ‘collective/private property’ describes the land as belonging to the tribe/clan that inhabits it. Afar land is normally (and ideally) equally divided among Afar clans, although the distribution can reveal discrepancies owed to social standing or dominance of certain tribes/clans in number or political power over other clans (Coubba 1993, p.62). Thus, these separate groups living along the coastal band between Ras-Ali and Doumeira were the only entities at liberty to use and manage that land.

The other aspect behind the *wano* is that the land could not be violated in any way by any one person, even a Sultan or a tribal chief without the permission of the individual family heads that lived on the tribal land. It represented an ancestral heritage that was precisely geographically delimited by natural features such as *oueds*, mountain tops, etc. Secondly, the *isso* (renting) of a piece of land or territory by a third party involved paying for its use in livestock heads by the renter to the lender. Such a situation was therefore temporary and did not refer to total relinquishing of use rights by the family heads. As both Afar leaders and the French infringed upon these rules, the coastal band between Ras-ali and Doumeira was fractioned in distinct pieces of land which were individually owned by multiple clans. Consequently, this treaty, although signed and acknowledged by the French, was not (and could not be) recognised by the Afar rural households that live on that land.

As indigenous populations feared Ethiopia towards the end of the 19th Century, most tribal chiefs gradually relinquished their rights over certain portions of the land in exchange for European protection. Soon though and aside from the Italian pressure to the North, as the French were having difficulty convincing the population to come to Obock to work, they wanted to move the colonial administration on the other side of the Gulf of Tadjourah. Therefore, the French now had their eye on the Somali-Ise's lands to the South. The process of land acquisition was much easier this time because the Ise considered that anybody had a right to use it. Since the Somalis (including the Ise) viewed land as belonging to nobody, it was a collective good, non-dividable in contrast to the Afars who believed land to be a private and collective property that needed to be defended and protected.

Among the Ise, each clan had a chief (usually the oldest and wisest) who managed the affairs of the clan, planned migratory routes, chose encampment locations, etc. (Coubba 1993, p.44-45). While the pastoral zones were clearly delimited among Afar tribes, it was not so among the Somalis-Ise. In 1885, the French signed their first treaty with the Somali-Ise Chiefs allowing them to occupy it in exchange for protecting it from outsiders and for receiving the French citizenship. In 1892, the official transfer of the administration headquarters from Obock to Djibouti was completed. In 1896, as the French were on better terms with the Somali-Ise than the Afars, the French colony was named as the *Côte Française des Somalis* (CFS). The name made no mention of the Afars who, at the end of the 19th Century, represented the majority of the population living in the Sultanates of Rahaito, Tadjourah and Debné Chiefdom (Charpin et al. 1977, Coubba 1993, p.20, 61).

As indicated in Table 4.6, the Europeans set up the borders of their respective colonies between 1888 and 1901. As the French were delineating the contours of their colonial acquisition, they simultaneously drew the borders of a political landscape at odds with indigenous social organization systems of the land. Traditionally, the Afars used to delimit a clan's territory or region based on geophysical markers such as mountains, rivers and bare-land. Land allocation was synonymous with the allocation of pasture and water for livestock (Coubba 1993, p.33-35). Consequently, every member of a clan could tell where the boundary of his 'homeland' was.

**Table 4.6 Sum-up of major treaties establishing the boundaries of the CFS and their impacts (1862-1901)**

| Date | Signatories | Terms of the treaty/accord | Reality contradictions |
|---|---|---|---|
| March 11th 1862 | France and Tadjourian Notables (Afar Sultanate of Tadjoura) | -Tadjourian authorities cede Obock and coastal band from Doumeira to Ras-Ali (and Goubet Al-Karab if needed) in exchange for 10 000 thalers (Imbert-Vier 2011, p.41, 60) | - Contradictory to the Afar rules of the *wano* and *isso*<br>- Rural households' opinion who live on that land not considered |
| August 9th 1884 (and January 2nd 1885) | Léonce Lagarde (France) and Sultan Ahmed Loitah of Gobaad | -Help transit of French caravans at a fixed price (one thaler per camel per European)<br>-Disputes between the French and Sultan's subjects settled by French administration<br>-Sultan not authorized to sign any other convention nor treaty without permission from Obock's Colonial Chief (Imbert-Vier 2011, p.66) | - Establishing a Protectorate on a land not belonging to the Sultan of Gobaad<br>- Contradictory to the Afar rules of the *wano* and *isso*<br>- Rural households' opinion who live on that land not considered |
| September 21st 1884 | Léonce Lagarde (France) and Tadjourian authorities (Afar Sultanate of Tadjoura) | -Sultan Hamed gives 'his' country to France in exchange for 100 halers/month and 80 thalers/month to the Sultan and Vizir, respectively (Imbert-Vier 2011, p.66, 68) | - No description of the actual delineation of the said 'country' in the treaty<br>- Establishing a Protectorate on a land not belonging to the Notables<br>- Contradictory to the Afar rules of the *wano* and *isso* |
| March 26th 1885 | France and Somali-Ise Chiefs | -Give their 'country' to France to protect it against any foreign invader (Imbert-Vier 2011, p.68-69) | - Contrary to Somali-Ise belief that 'land belongs to nobody and everybody'<br>- Nomadic households' opinion who live on that land not considered |
| February 9th 1888 | France and Great Britain | -Establishes French Colony's southern international boundary with British Protectorate (Somaliland) (Imbert-Vier 2011, p.73) | - Somali-Ise Chiefs not consulted<br>- Nomadic households' opinion who live on that land not considered |
| March 20th 1897 | Léonce Lagarde (France) and Ménélik (Ethiopia) | -Establishes CFS' inland international boundary with Ethiopia (Imbert-Vier 2011, p.97) | - Sultans of both Gobaad and Aoussa not consulted<br>- The boundary cuts through both sultanates<br>- Rural households' opinion who live on that land not considered |
| July 10th 1901 | Camille Barrière (France) and Giulio Prinetti (Italy) | -Establishes CFS' northern international boundary with Eritrean colony (Imbert-Vier 2011, p.93-94) | - Sultan of Raheito not consulted<br>- The boundary cuts through the Sultanate of Raheito<br>- Rural households' opinion who live on that land not considered |

*Source: Re-adapted by Author from Imbert-Vier, 2011*

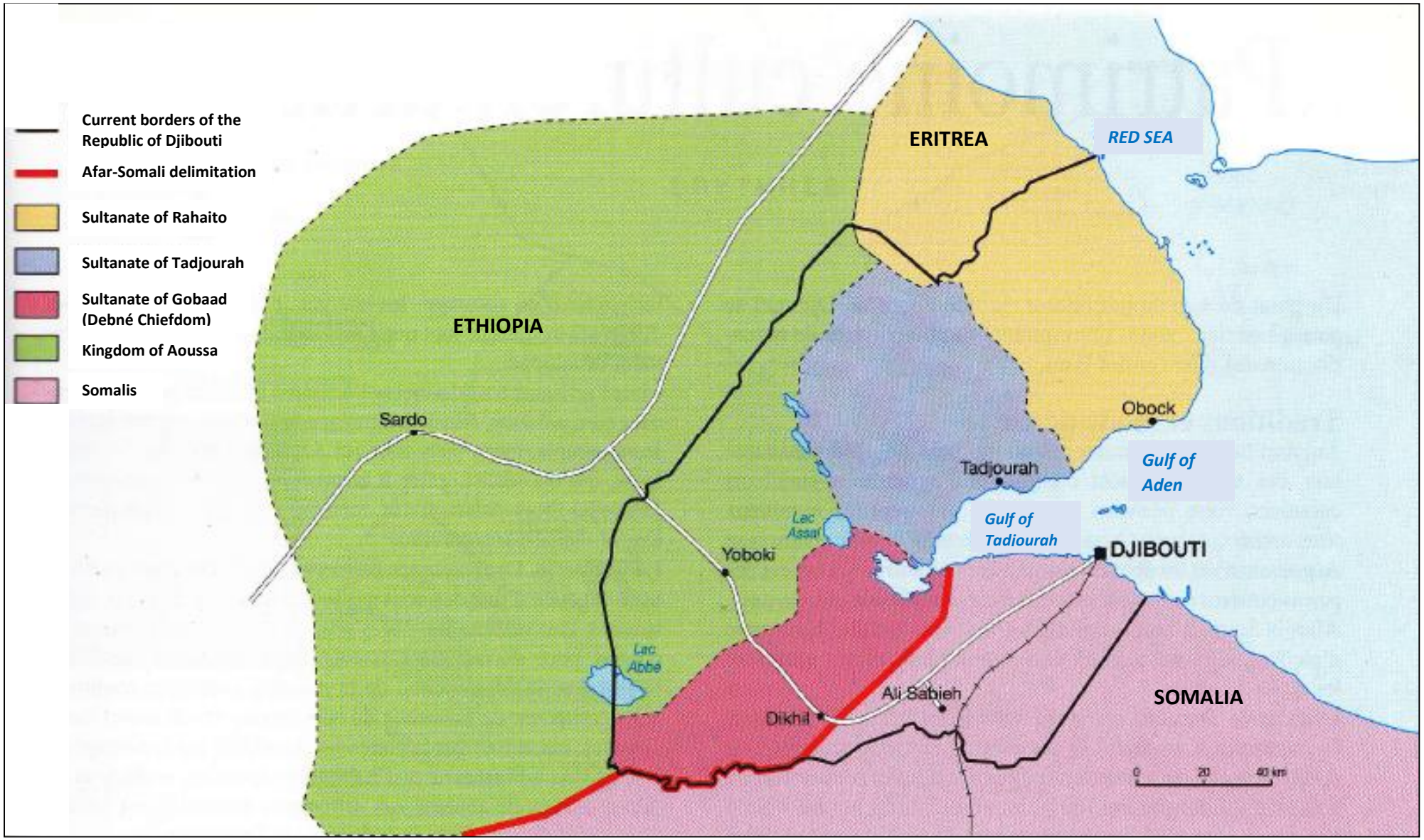
Contrary to the westernized viewpoint of land property rights, land delimitation among the Afars defined the boundaries of control rights (exclusion, alienation and management rights) of the clan without being in contradiction with the mobility requirements of pastoral life (Hundie 2006). The sharing of pasture land translated into solid structural solidarity between different clans which was reinforced by matrimonial ties and exchange of goods.

Similarly to the Afars and as with other northern Somalis, the Somali-Ise were not firmly localized nor were the movements of its members restricted to specific lineage areas (Lewis 1961). The Ise strongly insisted that the land that they occupied was for the purpose of grazing, open and accessible to the livestock of all Ise, no matter the clan or lineage affiliation. The Ise say that 'the Ise people are one', meaning that any family from any tribe could roam over the entire Ise 'country'. This corresponded to the fact that the Somalis (Ise included) were real nomads, covering very long distances compared to the Afar who respected more codified routes (Oberlé et al. 1985, p.43). Among the Somalis in general, each tribe moved along and rarely deviated from their respective pastoral corridor.

Soon though and as seen in Figure 4.4, populations belonging to common agnatic groups found themselves divided and separated by conceptually fictitious boundaries. As a result of border-making by Western powers, entire tribes had their grazing lands and transhumance routes spread over two and even three different States. For instance, the Sultanate of Raheita was shared between Italy (Assab and Raheita in present-day Eritrea) and France (Obock in present-day Djibouti). Subjects of the Sultanate of Gobaad found that their summer pasture lands was under Ethiopian sovereignty while pastoralists from the Kingdom of Aoussa, in Ethiopia, who used to move to lands located in the CFS over the winter were now denied access to these zones (Coubba 1993, p.80).

On the Somali side, the land inhabited by the Ise was divided up between three powers. Originally, Ise territory used to stretch from the southern side of the Gulf of Tadjourah in the *Côte Française des Somalis* (CFS), until Zeila in British Somaliland (present-day Somalia on Figure 4.4), and up to Gildessa (close to Harar) and Herrer, in Ethiopia. In parallel, the French had to negotiate with Ethiopia in order to keep the CFS unharmed. They signed a treaty with Ethiopia stating that the former were to later surrender the Somali territories of the Ogaden and the Haud to the latter in 1948 and 1954, respectively, against the known wishes of the Somali inhabitants of these regions.

**Figure 4.4 Distribution of the Afars and Somalis at the end of the 19th Century**




*Source: Translated into English by author and adapted from Dubois, 2007*

The Somali-Ise were sacrificed as parts of their pasture lands were given to Ethiopia. Later, the Anglo-Ethiopian treaty of 1897 was signed between the French and the British which made the French relinquish the Afambo region (Figure 4.5), rich in pasture land and water points in exchange for the Moussa Ali, an arid mountain (Oberlé et al. 1985, p.136). This treaty, bringing in borders and alienation of the land has had detrimental effects on local land usage and on the environment (Mohamed 2004). Soon, most of the rich pasture lands that were once accessible to both the Afars and the Somali-Ise were now hardly reached due to socio-political changes unfolding throughout the region.

As seen here, the inland part of the Horn of Africa housed nomadic pastoralists who were used to freely roam with their flocks from coast to coast without any restrictions. Evidently, since this mode of living is common to different people and different tribes, there have long been clashes between indigenous groupings from time to time because the welfare of herds, which constituted the social basis of pastoral livelihoods, took precedence over anything else (Sheik-Abdi 1977). 'One's quality of life [was] directly affected by resource endowments [and] property rights [defined] how existing resources [were] utilized, who [would] utilize what attributes of the resource, and so on' (Hundie 2006). As a result, these restrictions have had detrimental effects on domestic groups' livelihoods with access to certain pasture lands now denied to both Somali and Afar pastoralists. Spread over three different States, this partitioning of the land led to the multiplication of conflict between clans and indigenous groups in the region.

As will be seen in the next section, although these treaties were signed, individual Ise families, based on their traditional customary rights, still only recognized the ancestral limits of their 'country' and deliberately ignored the artificial colonial borders (Thompson et al. 1968, p.23). Because of the necessities related to the nature of their livelihood, frequent movements between Djibouti and Somalia in search for winter pasture lands and into Ethiopia for summer pasture lands still occurred. Meanwhile, the Afars were completely forgotten by the administration which had moved to the other side of the Gulf of Tadjourah, in Djibouti City. At this time, the authority and power of the central administration extended only up to the limits of Djibouti City, its immediate surroundings, the railway and the locality of Obock where a small military unit was based. Official penetration inland of the French did not occur until 1924. This is when direct contact and particular institutional power relationships established themselves and determined future events leading up to the configuration of present local indigenous groupings.

## 4.5 Territorial confinement of the nomads

As seen in the previous section, from 1860 to 1900, the Somali nation was divided into five regional groupings with the following configuration: French Somaliland to North-West (the CFS), British Somaliland Protectorate (with no colonial settlers) to the North-East, the Italian colony of Somalia towards the South, the Ethiopian Ogaden (named after the local Somali clan inhabiting it) and British northern Kenya (Lewis 2004).

The common conditions of pastoral life transcended and reinforced solidarity between rural pastoral households. The harsh conditions of life in an unpredictable land, common religion, and spatial proximity were among the many features that united seemingly distinct groups of people inland. Although there were differences in the hierarchical structuring of societies, traditional rituals, language or the way huts might be built, the foundations that made pastoral life so viable in this non-equilibrium environment were shared between all pastoral groups.

As shown later in Figure 4.6, transhumance paths of pastoral groups, whether Afar or Somali-Ise, crossed national boundaries and into neighbouring countries. The Ise can be divided into three great territorial groups as a function of their zone of nomadization: to the West, the *Djahmaggrato* of *Wea* (in the winter) to the *Airorre-Dadin-Aichiti* (in the summer); to the east, the *Banin Djog* between Djibouti-Loyada-*Djallelo-Holhol* (in the winter) and Somaliland (in the summer)[13](Imbert-Vier 2011, p.291).

During the first decade of the 1900s, the French administration was not concerned with delimiting zones of transhumance and movement between the different indigenous groups found inland in the CFS. Up until 1910, the indigenous ancestral delimitations established prior to the arrival of the French remained in spite of the borders that were institutionalized in 1897 (boundaries between Ethiopia and the CFS) and 1900-1901 (between Eritrea and the CFS).

### 4.5.1 The railway and its effects on local economies

In March 1894, Menelik signed a concession contract for the construction of a railway by the *Compagnie Impériale des chemins de fer Ethiopien* to link Djibouti to the Blue Nile, through

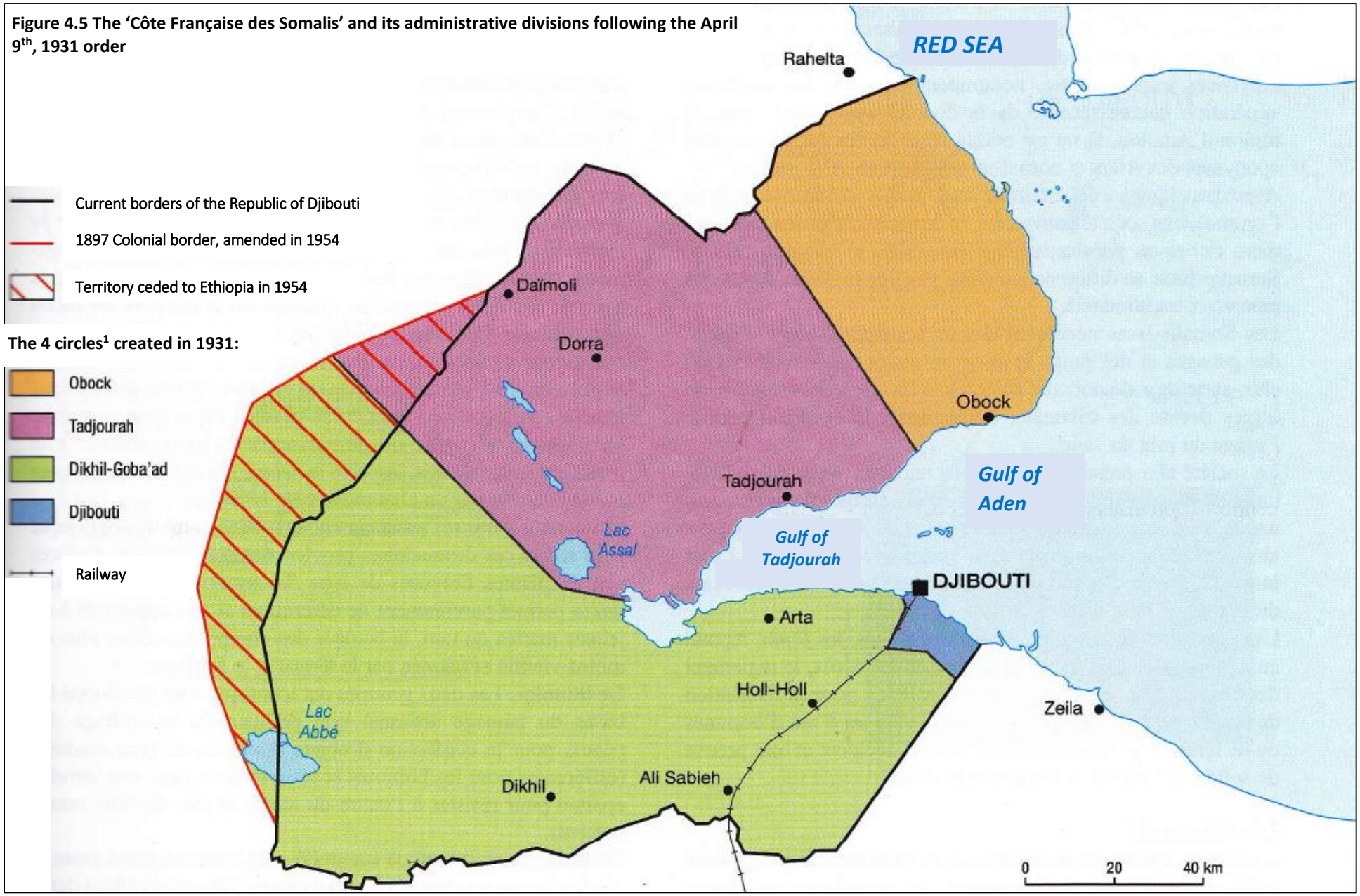
[13] A Map of transhumance axes in rural Djibouti can be found at Figure 4.6.

Harar, Entotto and Kaffa (Oberlé et al. 1985, p.77). Works started in October 1897 and reached Addis in 1915. Soon after, ancient commercial routes taken by nomadic caravan gradually began to lose their importance. These ancient caravans were not just merely commercial means of exchange. They used to facilitate the maintenance of regular contacts and alliances between tribes and peoples. Oral contracts and negotiations over the land among the Sultans used to feed into the social basis upon which nomadic societies were built: livestock. The ways in which the political landscape was changing was in effect isolating the different indigenous groups from one another. The combination of the railway and the new borders set up by the Europeans began to constrain the contacts and relationships between nomadic groupings.

As a result of the decline in indigenous trade, centres like Tadjourah and Ambabbo witnessed their commercial networks gradually diminish in importance and attractiveness. Raiding, which was another means of resource re-allocation, increased and then gradually dwindled in frequency and intensity. Local populations gradually lost the trading incomes that had been an important source of revenue for individual households' livelihoods.

Now that the administration centre had been moved from *Dankali* (Afar) land to Djibouti city in Ise land on the other side of the Gulf of Tadjoura, the French recruited skilled construction workers from Somalia to develop the capital instead of the indigenous pastoralists who were too unfamiliar with urban life (Coubba 1993, p.222). In effect, aside from the fact that both the Afars and Somali-Ise were still very much attached to their pastoral way of life, the Somalis of British Somaliland had already started their own urbanisation process. As a result, the various exogenous Somalis (Gadaboursis, Isaq, Darod), including the Arabs, knew better the advantages associated with urban economic life. Since the railway cut through Ise land from Djibouti to the Ethiopian border, little villages soon appeared around railway stations such as Chebele, Hol-Hol, Dasbiou and Ali-Sabieh (see Figure 4.5). Still, the Ise adapted relatively quickly and managed to negotiate a toll fee of 25 thalers per kilometre, which represented a very small cost for the Ethiopian Railway Company (Thompson et al. 1968, p.24, Coubba 1993, p.79).

**Figure 4.5 The 'Côte Française des Somalis' and its administrative divisions following the April 9th, 1931 order**




*Source: Translated into English by author and adapted from Dubois, 2007*

[1] *A 'circle' was an administrative term referring to a 'zone' at that time.*

### 4.5.2 Imposition of geographical constraints: man-made resource scarcity

Confined within the CFS, the indigenous had to share what little pasture land was found inland. Afar and Ise spatial configurations were constantly negotiated and renegotiated, and subjected to varying power relationships and environmental fluctuations. Prior to the colonial period, the antagonistic perceptions of the land between the Somali and the Afar used to lead to eternal frictions, tensions and conflict between the different pastoral groups living in the harsh environment of the Horn of Africa. Cohabitation was hard with frequent conflicts between the Ise and their neighbours, mainly the Afar of Abyssinia and Northern French Somaliland respectively to the West and North, and the Gadaboursis to the South-East in present-day Somaliland (Oberlé et al. 1985, p.43). There was constant competition for resources often leading to warfare and raiding of neighbouring tribes. Yet in parallel, building cooperation, solidarity and alliances with other nomadic groups was also vital for the survival of each group (Kapteijns 1995). Such ties to ensure economic support were often created through inter-marriage between clans, tribes and even (but rarely) between Afar and Somali. However, with the advent of colonial borders, indigenous groups soon found themselves confined in restricted areas for grazing their livestock. As a result of these new geographical constraints, the relationship between Afar and Somali ethnic groups became highly conflictual. In the early 1900s, because of frequent clashes along transhumance paths, a peace treaty was signed between the Ise and Afar chiefs delimiting their respective territories and pasture lands. It was agreed that instead of crossing over each other's transhumance paths, each ethnic group would make use only of the pasture land in their own area (Imbert-Vier 2011, p.292). If needed, the administration itself would organise raids and confiscate indigenous livestock to punish infringements to their rules[14]. In 1914, the 'Ise' and 'Dankali' districts were created and read as follows:

> 'The Ise district comprises the territories of the colony inhabited by populations of the Ise race [...]. The Dankali district comprises the territories of the colony inhabited by populations of the Dankali race and extending to the East until Ras-Ali.' *(Imbert-Vier 2011, p.293)*

[14] Violent incidents erupted in 1941 in part of the territory belonging to the Kingdom of Aoussa. A fee of 36 oxen, 50 female camels and a certain number of stolen weapons (firearms) was imposed collectively on the Oloto community for trespassing. In 1953, the Olotos were once again accused of crossing over the limits set by the administration and were indefinitely expelled by the French army from the Hanlé plains, which were then reserved by the administration for the Adorasoul part of the Debné Chiefdom.

This passage illustrates the gap of conceptual and anthropological understanding that separated French perception of local traditional dynamics and the reality lived by indigenous nomadic groups on the ground. The Afar and the Ise are not two separate races. On the contrary, although culturally different, there are many similarities between them. Even though they historically share a conflictual past (Thompson et al. 1968, p.24), they have much in common. Both speak Cushitic languages and are Muslim. They are pastoral and nomadic in their way of life.

In November 7th 1916, another administrative order adds precision to these delimitations:

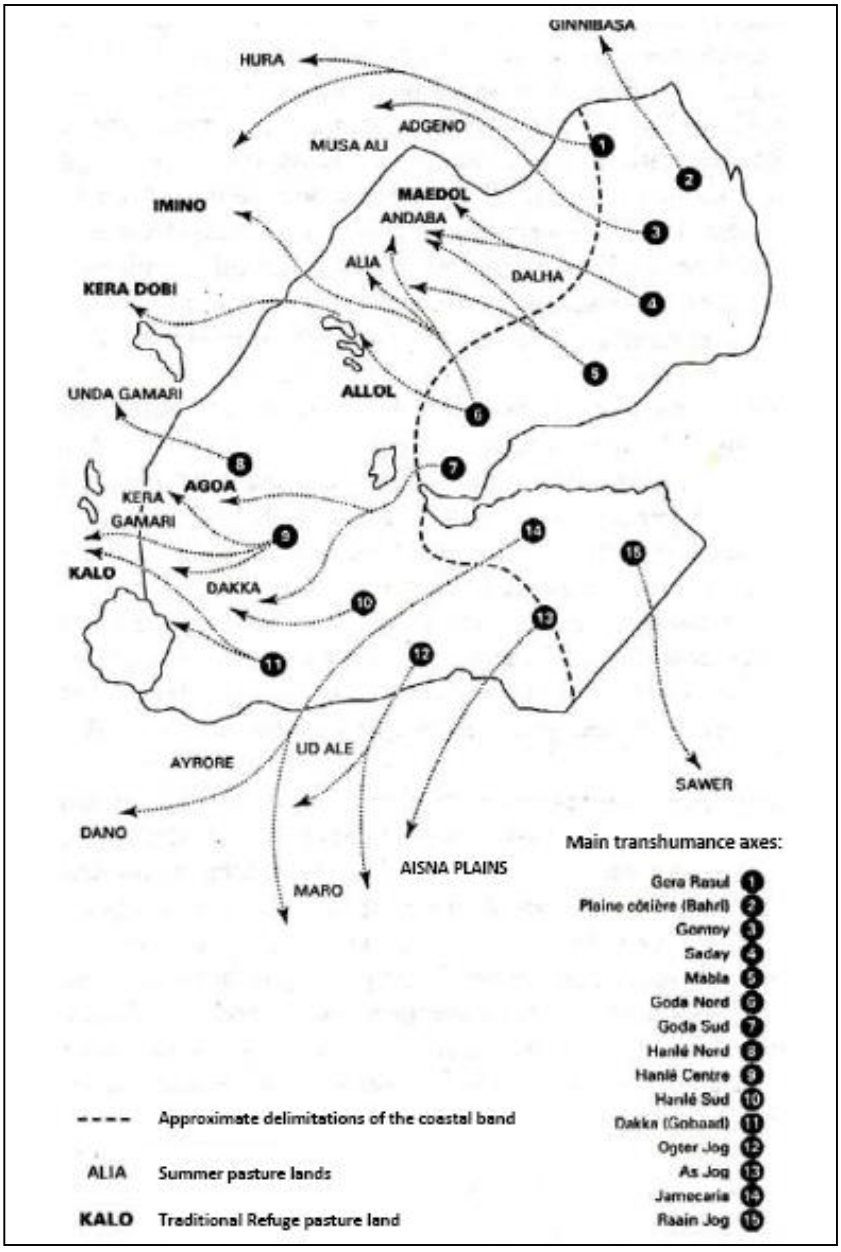
> 'The Dankali district comprises the territories of the colony inhabited by populations of the Dankali race and extending from the border with Eritrea to limitation of the Ise country, including the Sultanate of Tadjourah and the territory of the Debné' *(Imbert-Vier 2011, p.294).*

However, the indigenous peace treaty and the administrative orders confining pastoral groups to certain areas were in contradiction with the inherent features of an ecosystem that was unpredictable and constantly fluctuated. For local inhabitants, the territorial question (and transhumance) was above all, a question of access to pasture land for livestock, the primary basis of livelihoods for the Afar and Somali nomads alike (see Figure 4.6). In particular, the bond of the Afar with their land cannot be emphasized enough and has persisted up until today. Aside from the fact that it is sacred and very much cosseted as a traditional heritage and form of wealth and power, the territorial question soon revealed the disequilibrium that was created between ecosystem services (dependent on rainfall) on one hand and people and livestock on the other. Clan land implied the existence of grazing areas comprising dry season retreats, browsing resources and water points.

In February 1938, a large number of Somali-Ise settled with their herds in Koutabouya, Asbahalto and Korbili located in the Debné Chiefdom without prior negotiation of its access. In July of that same year, a prolonged drought decimating all the livestock in the Obono valley forced the Ise to migrate in the Gobaad plains, its surroundings and in the South of the Dakka plateaux, in the lands of the Debné. This time, negotiations fixing the zones of transhumance took place in Dikhil and a

treaty was signed between the Debné and Ise Chiefs establishing those zones North and South[15] (Imbert-Vier 2011, p.296).

**Figure 4.6 Transhumance axes in Djibouti**




*Source: Audru et al., 1987, p.305 and Piguet, 1998, p.48*

[15] This treaty was signed on August 9th 1938 by eight *Okals* (local chiefs paid by the administration as intermediaries between their community and Djibouti City), four Debné and four Ise.

The treaty signed between the Debné and Ise Chiefs regulated the latter's encampments in the Gobaad and Dakka zones. It was known at the time that the *karan/karma* rainy season usually lasted more or less from July to September with the short *diraac/sougoum* rainy period from March to April. Bearing that in mind, the Ise were thus allowed to graze their livestock in the Gobaad during the 'dry season' until the Northern delimitation which corresponded to the 'oued of Dagadlé, oued of Katoumbata, Dixa Deré, Abouyoussouf, Bourteli, Abaitafa, Galamo' (Imbert-Vier 2011, p.296).

Notwithstanding these efforts, tensions would regularly arise, and a new treaty was signed in 1950 revising and re-assigning the zones to the Ise and Debné as well as a just share of land and access to water points. This treaty was again revised in 1959 based on the terms of 1938. It was further revised several times in the following years because, understandably, environmental pressures on either group would invariably lead one group or the other to cross over each other's pasture lands. One of the main reasons that participated in reinforcing these difficulties is the fact the Somalis in general have less of an attachment with the land than the Afars. The Somali-Ise, more mobile than the Afars, only knew the ancestral limits of their 'country' and deliberately ignored the artificial colonial boundaries, both within and around the CFS. The Somali-Ise often circulated between the CFS and Somalia where they found winter lands and Ethiopia where some went in search for summer pasture lands (Dano, Maro, Ud Ale, Aisna Plains).

### 4.5.3 Rise of conflict over environmental resources and social implications

The previous sub-section showed how hard and socio-politically unsustainable it is to confine nomadic groups. From the moment the borders were set up added to the peace treaties confining each nomadic group in their own area for livestock rearing, the French often had to act as a third party frequently arbitering disputes between indigenous groups.

In the management of the land, each clan presented a well-established gerontocracy where decisions about the use and allocation of natural resources extracted from the land was vested upon

a village council constituted of the clan leader, elders, the *fi'ma*[16] for the Afar or the *Gendi*[17] for the Ise and local wise-men (Hundie 2006, Renders 2007). These customary rights were recognized and respected by all. According to environmental fluctuations, herd management followed rotational grazing depending on the amount of precipitation falling in any given year. If it was normal over successive seasons, clan members were asked not to use reserve pasture lands until other areas were exhausted. In the case of the Afars, although individual household heads had an inalienable use right over the resources, 'intra-clan customary laws [bounded] his/her use rights' (Hundie 2006).

The setting up and confining of nomadic populations indirectly heightened environmental pressures on Afars and Ises's pastoral livelihoods alike. These frequent conflicts due to territorial confinement of the people and the regular arbitration by the French administration in settling disputes was becoming hard to deal with by local indigenous tribal chiefs. As those conflicts regularly erupted, the power of traditional means of conflict management soon diminished. At the same time, as lands were progressively expropriated from indigenous hands, control of local political and social life in the territory gradually moved from community elders, tribal chiefs and Sultans to the French administration in Djibouti City. The situation was even worse for the Somali-Ise since their *Ugas*, who was (and is) the supreme judge in charge of ensuring the application of the *Xeer*[18] and social peace from Dire-Dawa (Ethiopia), had already been separated from the Somali-Ise living in the CFS through the border-making process (Coubba 1995, p.39-40). Yet, it was crucial for the administration to maintain fundamental divisions between the Afar and the Somali. These internal conflicts suited them as it lowered the risk of being confronted to a potential anti-French coalition:

> 'Because of the secular hatred that exists between Ise and Danakil populations, [...] there is no fear of, in any circumstance, of a general revolt by the indigenous'*(ANOM, 1910 quoted in Imbert-Vier 2011, p.293).*

[16] The *Fi'ma* intervenes in all kinds of situations, from the household level to the tribal level. If some families were impoverished because of a drought, the *fi'ma* could help through obligatory tax collection.
[17] The *Gendi* is both a judicial court of appeal and a ritual emergency usually summoned in times of crisis. It often works with the *Ugas*.
[18] The *Xeer* comprises a set of rules that govern much of Somali-Ise pastoral life. It is often seen as a contract that is honored by every Somali-Ise.

At the end of the 1920s, the circle of Dikhil was multi-ethnic, with both Somali-Ise and Afars living in and around Dikhil. The North was dominated by the Afar while the South was divided into one Afar zone (part of Dikhil) and one Somali zone (rest of Dikhil and, Ali-Sabieh and surroundings). From 1930, occupation inland of the colony by the French administration located in Djibouti City ignored local ethnic boundaries. As clashes would become more frequent, the main duty of the French army sent inland was to increase control of the territory and its inhabitants. Their objective was to impose a strict control over the movements of herds and pastoral groups. Frequently, the administration would impose sanctions for disobeying to the rules delimiting pastoral areas. They often targeted rural livelihoods, i.e. confiscated or even killed livestock as punishment. These practices were often executed on an entire community without discrimination. In turn, these sanctions had detrimental impacts on individual households (especially those bearing the brunt of the punishment for the entire community) at the social level. Indeed, livestock raiding/confiscation by the administration would have indirect effects on intra-clan relationships, even if most goods within a clan were usually shared among its members to some degree. The French were frequently met with strong opposition inland. For example, the King of Aoussa refused to accept French sovereignty:

> 'Yayyo Mahammad ([King] of Aoussa) pretends that his sovereignty extends wherever his subjects are', while the French contended that 'all people present [on our land] [...] and himself if needed, must also submit to our police and our laws' *(ANOM, 1943, cited in Imbert-Vier 2011, p.360).*

The differences between indigenous and western perceptions of territoriality shown in this passage often translated into miscomprehension and tensions between both parties. In their quest to gain control over the people inland of the CFS, they first tried to occupy Tadjourah. However, they were opposed by the Sultan Mohamed Ibrahim. At his death, according to customary rules, the Vizir was supposed to replace him. Indeed traditionally, the Sultan and the Vizir had to be chosen alternatively from the Bourhanto and Dinitte families of the Adali tribe. However, the son of a deceased Sultan submitted his candidacy with support from the French administration. The French exerted pressure on the local community and eventually succeeded in making him Sultan after his father. Furious, the Vizir tried to organise a rebellion. Eventually, the administration deported him to Madagascar (Oberlé et al. 1985, p.104). Similarly, the same thing happened to the Sultan and

Vizir of Gobaad who also ended up being deported to Madagascar for ten years for resisting French colonial rule.

In essence the situation was one of a superimposition of an exogenous 'rule and law' system on a land with a totally different socio-cultural mode of life. This state of affairs is constantly brought up in the literature on colonisation of the Horn of Africa, whether it has to do with containing nomadic people in fixed boundaries, introducing a centralizing polity in a region where power is distributed among tribal Chiefs and *Dardars* based on ancestral lineages and prestige, or fining/raiding an entire community's livestock from which the very livelihood of all households depended on. Indeed, fining a community meant fining all households in the group since livestock was often shared, borrowed and exchanged, and determined social status and matrimonial linkages between ethnic groups.

## 4.6 Conclusion

This section has shown the confrontational aspect of colonisation between western civilisation and local indigenous people. The process of land acquisition through the signature of treaties by parties who did not represent the people whose livelihoods were based on the very land that was a stake was as much an anachronism as the nature of the artificial boundaries that delimited it.

Hence, these treaties were in contradiction with the traditional rules that governed the use and management of indigenous land. As a result of border-making by Western powers, entire tribes had their grazing lands and transhumance routes spread over two and even three different States. In addition, with the birth of the railway, ancient commercial routes usually taken by nomadic caravans gradually began to lose in importance.

As a result of the decline in indigenous trade, centres like Tadjourah and Ambabbo witnessed their commercial networks gradually diminish in importance and attractiveness. Irrespective of the environment (non-equilibrium) out of which local Afar and Somali socio-cultural systems have arisen, drastic decisions based on a western perception of land property use were taken, affecting

the livelihoods of thousands of families. Still, the strength of agnatic and family ties remained a source of protection although new tensions were created through territorial confinement.

# 5 Dynamic pressures and their impacts on the pastoral landscape

## 5.1 Introduction

This chapter represents the next step in our study of the social production of rural vulnerability to drought. It aims to offer a response to the second research sub-question stated in Chapter One which is reiterated here:

- What are the dynamic processes involved in reinforcing the effects of root causes on rural vulnerability through time and space?

To address the aforementioned sub-question, this chapter identifies the 'dynamic pressures' that reinforce the effects from root causes of vulnerability discussed in Chapter Four. As explained in Wisner et al (2004, p.53)'s book, 'dynamic pressures are processes and activities that 'translate' the effects of root causes both temporally and spatially into unsafe conditions'.

In the context of this study therefore, the 'dynamic pressures' are those that exert undermining forces on the pastoral livelihood system. These factors are 'dynamic' in that they represent effects that are repetitive and/or constant in time and space. More 'contemporary' and/or 'immediate' than the root causes, the study of these pressures reveals "conjunctural manifestations" of "underlying economic, social and political patterns" (Wisner et al. 2004, p.53).

The elements to be covered include rural migrations and regional dynamics of conflict over pasture lands at the political level. In addition, the chapter examines the failed commercialization of livestock and its impacts on pastoral livelihoods. Finally, the drivers of economic growth in Djibouti are reviewed as well as the effects of Djibouti's entry into the world economy on rural livelihoods.

## 5.2 Rural migrations

There have been two main types of migratory flows. One, rather external, in the early days of the CFS, was motivated by the need for workers to build the foundations of political structures, administrative offices, commercial buildings and the railway. The other, more internal, manifested (and is still manifesting) itself through rural exodus of indigenous pastoralists to urban centres. In the context of this study, the 'push and pull' factors behind these displacements have profoundly reconfigured the spatial and cultural landscape of rurality in Djibouti.

Migration fluxes have been constant since the birth of Djibouti city after the administrative centre of gravity of the colony moved from Obock to the other side of the Gulf Tadjoura at the end of the 19th Century. To make Djibouti city more competitive than the port of Aden on the other side of the Bab-el Mandeb Detroit, the French needed to offset and extract as much profit as possible from the geopolitical and strategic location of Djibouti city. Aside from the Arabs and the Indians, most were originally from Somaliland. Up until the 1960s, the Isaq, Gadaboursi, Darod and to a lesser extent the Ise migrated to the capital of the colony.

This migration has had an impact on local politics and, indirectly, has fuelled tribal animosities within the Somali community. The Somali-Ise and the Afar were initially reluctant in participating in the political life of the colony and were still attached to their traditional pastoral life. The only tangible connection they had with Djibouti was commercial in nature as they traded milk, butter, animal skin, sugar, tea and fabric with it (Chiré 2012, p.54). The revenue from this developing trade was an additional source of financial capital for the pastoral families who, at the time, were gradually seeing their caravan commercial routes cut off by administrative barriers. From 1947 to 1963, the population in the circle of Djibouti doubled, going from 19 000 to 41 000 inhabitants. According to Thompson and Adloff (1968 quoted in Coubba 1993), in 1959, one census showed that the Isaq and Darod comprised 23.8% of the total population in the circle of Djibouti; the Ise followed with 17.3%, the Gadaboursi were in 4th position with 9.74%. The Afar formed the smallest ethnic group with less than 5% while the Arabs were in third position with 16.1%. In view of this foreign domination of Djibouti city, the indigenous progressively started to open themselves

to the possibility of migrating out of their local territorial/political boundaries into Djibouti city, the locus of urban politics.

The collective identity of the indigenous pastoralists underwent drastic changes over the years as the administrative centre located in Djibouti city was increasingly extending its sovereignty inland. The progressive establishment of interior delimitations, circles and constituencies (1949-1965) ushered in changes in pastoralists' perceptions of their environment. The process was instilling a new reality, bound by physical (borders) and conceptual barriers (the rule of law in a nation-state), where territoriality rhymed with collective identity. The social experiment of the French on the pastoralists revealed that both social and cultural changes accompanied the establishment process of the foundations of a nation-state. Pastoralists' perceptions were changed to a point where, because of less exchange with their indigenous neighbours in Ethiopia, Eritrea and Somalia combined with the centralization of power in Djibouti city, the nomads progressively realized and understood that their survival was conditioned upon their participation and integration into urban life, the locus of political power and recognition. As their sense of collective identity and historical background made them the rightful indigenous members of the colony, it was their right to participate in directing the course of the political tangent of the colony in accordance with the French administration's wishes. As a result, the Afar and Somali-Ise reacted against the excessive arrival of exogenous (Somalis and Arab alike) and thus started to out-migrate from *badia* (countryside) to the city.

Concomitantly, the 1960s witnessed the beginning of a series of food crises with unusual damaging effects of dry seasons on pastoral livelihoods. Forgotten by the administration, the conditions of living of pastoralists rapidly deteriorated as they overpopulated and overexploited an arid land used to temporary residency and mobility of livestock. Djibouti city (and other urban centres in the territory such as Dikhil and Ali-Sabieh) grew in attractiveness:

> "Djibouti, it's the hive at work which attracts labour in the thousands [.] Djibouti, it's the East African haven [with] immense docks, large workshops, uncountable shops, a market overwhelmed with objects, foodstuffs, a local hospital and multiple offices of the public administration which desires […] overcome all new needs as it offers advantages that are inexistent elsewhere between Egypt and India; and where tomorrow, the telegraphs, telephones, tramways, the opening of a train station, an anchorage for the biggest

> ships, frequent maritime postal services, water canals multiplying the number of street fountains and spreading greenness in squares, will convey the illumining charms of Marseille in the vicinity of torrid areas." *(Translated from French by author, Oberlé et al. 1985)*

Djibouti city rapidly became the centre of commercial exchange, trade, construction works and flourishing modernity in opposition to the simplicity and 'backwardness' of pastoral life. The beginning of the 1970s witnessed a massive settling (rural exodus) of rural Somali-Ise and Afars in villages, peri-urban areas and cities. It was the first great migratory phase of the indigenous (Chiré 2012, p.76).

Already weakened by geographic space limitation on nomadic pastoralism and the plummeting of traditional caravan marketing between the indigenous people, pastoral livelihoods of rural populations in the Horn of Africa (HoA) were further affected by the droughts of the 1960s and 1970s (Chiré 2012, p.78). As pastoralists witnessed their natural and financial capitals decreasing, thousands of them migrated to cities, crossing over the borders of French Somaliland to reach Djibouti city. Combined with the production of refugees who had fled the Ogaden war and Djibouti's accession to independence, the territory's total population grew by 20% in 1977 (Chiré 2012, p.79) With regards to transhumant and nomadic pastoralists, figures show that while in the 1940-1950s more than 70% of them were found in rural areas, in 1989, they represented no more than 16% of the total population (Guedda et al. 1984, p.113). Interestingly, the majority of those who out-migrated from rural areas to Djibouti city were from the Districts of Djibouti (21.50%), Ali-Sabieh (21.50%) and Dikhil (8.50%), which were exclusively (apart from Dikhil) inhabited by the Somali-Ise (p.87, Chire, 2012). This concords with the observation made by Ali Coubba (1995, p.50) that the Afars, more attached to their ancestral heritage that the lands represents, were rather reluctant to move out and seek urban life.

According to a survey conducted with a sample of 200 individuals by Amina Chiré (2012), rural pastoralists out-migrated mainly to search for jobs (21.5%) and because of severe impacts from drought (17%). However, the author also found that decomposition of the familial structure due to the increased presence of the elderly and orphans in individual households was very significant too. If the categories of migration causes were regrouped, in fact these factors (family break-

up/decomposition, presence of elderly, orphans, etc.) *together*, represented the greatest force of migration.

These results tally with those obtained through fieldwork where most respondents' family members who migrated to the city cited the need for remunerated work as the main reason for migration to the city. The analytical complexity of these factors lies in the differential impacts from drought on pastoral livelihoods, the range of adaptive measures adopted by individual pastoral households and the difficulty in extracting the real reasons behind the adoption of these measures. On one hand, a progressive transition was operating with settlement in villages and cities (among which Djibouti city) representing an adaptive strategy that diversified households' sources of income. On the other hand, it created a rupture in the family structure, provoking an imbalance in roles that was difficult to reconcile as members of the same household were spread out in different locations for varying lengths of time. This is more explored in Chapter Seven where the sedentarization process and its implications are discussed.

## 5.3 Regional dynamics of conflict over pastoral lands

Two years after the independence of the TFAI, renamed Republic of Djibouti, the Decolonization Committee of the United Nations of 1979 stipulated that the French had to unconditionally grant independent status to the colony, and that Somalia and Ethiopia had to stop their claims over the little Republic. This section discusses the role played by Ethiopia, Somalia and Djibouti on one side, and the different local indigenous ethnic groups on the other and how the Afars and Somali-Ise have found themselves in the midst of contradicting forces on separate occasions.

As briefly seen in Chapter Four, past conflicts between the Afar and Somali-Ise were usually linked to water and forage scarcity forcing groupings to crossover traditional transhumance and/or nomadic routes. Constant tension between the Afar and Somali-Ise was also reinforced by a historical and cultural tradition of conflict centuries back between the two groupings. The Ise consider that land belonged to everybody and anybody since they viewed the land as a gift from Allah, ergo all creatures were entitled to access it and use the resources it offered. As it will be seen in this section, external interventions and trans-border political alliances played a major role

in shaping the nature of the relationships between the Afars and the Ise. Past conflicts used to erupt between pastoral groups because of resource scarcity and lack of water for human and/or animal consumption. By the turn of the 20th Century, such conflicts had been transformed into competition over territory and political control in Djibouti city.

### 5.3.1 Pan-somalism and the Somali-Ise

A product of British Somaliland and Italian Somaliland, Somalia was founded in 1960. Upon its independence, although there were internal divisions and differential perceptions due to separate evolutionary movements adopted by the two Somalilands (Northern British and Southern Italian), the Somalian leaders of the time sought to reclaim the different zones inhabited by the Somali in the Horn of Africa (Coubba 1993, p.261, Yasin 2010, p.87).

At this point, it is important to make a clear distinction between the 'Somalis' and the 'Somalians'. The Somalis designates all those ethnic groupings of the Horn of Africa belonging to the Somali community. Consequently, irrespective of the territory and/or country in which they live, they are members of the indigenous Somali community of the Horn of Africa. The Somalians rather refers to all those having acquired Somalian citizenship and who are therefore citizens of that State. It follows that all Somalians are not necessarily Somalis and vice-versa.

According to customary traditions, the zones inhabited by the Somalis must be part of the Somalian country. The pan-somalian movement wished for the reunification of all the Somalis living in eastern Ethiopia (Ogaden region, now renamed Somali Region of Ethiopia), Djibouti and North-Eastern Kenya under the banner of 'Greater Somalia'. These zones were acquired by colonial powers at the end of the 19th Century and beginning of the 20th Century through treaties. The preamble of the Constitution of the Republic of Somalia stated that "the Somali Republic promotes by legal and peaceful means the union of the territories' and that 'all ethnic Somalis, no matter where they resided, were citizens of the Republic" (Yasin 2010, p.87). Since they are Somali, they automatically had the right to obtain Somalian papers. As the Somalian government sought to find a diplomatic exit to the territoriality issue, Ethiopia proceeded into terrorizing the Somalis (Ise in their great majority) inhabiting the Ogaden region to force them out of Ethiopia in an effort to

maintain the land under Ethiopian rule. These practices, aside from direct attacks on villages, theft and murder, included (but were not limited to) preventing the Ise from seasonally crossing over the Djibouto-Ethiopian and Somali-Ethiopian borders in search for pasture and water (GoS 1974, p.47-48).

Meanwhile, Djibouti became independent in 1977 and, as its Somali-Ise government was receptive to the pan-Somalian message, the bordering Somali-Ise of rural Djibouti and those living on the Somali-Ethiopian border trained and backed by the Somalian Republic intended to recuperate the great pasture lands of Awash Valley. At the same time, their aim was to extend the *Somali*[19] territory's frontiers further from the Erer River westward of the Addis-Assab main road and northward to the Obno valley and then to Aditu, a village in the Awash valley basin. As the valley was mainly inhabited by the Afar, the Somali-Ise intended to drive them out. According to Yasin (2010, p.88), the discreet support of Djibouti behind the expansion campaigns within the Afar region in Ethiopia ranged from flour distribution to financial support from the government of Djibouti:

> "Djibouti [had] become the main station for trafficking arms, providing intensive political and logistical support to the Ise in Ethiopia. Nowadays Ise, straddling the boundary between Ethiopia and Djibouti, have managed to connect Gadamiatu and Undufo (hamlets in Ethiopia) to Asale and Ali-Sabieh towns in Djibouti. Despite the internationally recognized border of Galafi between the states of Ethiopia and Djibouti, Ise on both sides are able to move people and goods freely without checks." *(Yasin 2010, p.89)*

When a relatively important armed conflict erupted on the Ethiopian side of the border between the Afar and the Ise, Djibouti would send Ise advisors and commanders on the other side to guide Ise fighters[20]. After the fall of the then president of Somalia Siad Barre in early 1991, the financial and military support for the Ise greatly diminished and civil war broke out. Kidnapped in its own land, the local population suffered greatly with over hundreds of thousands of deaths due to conflict and starvation since 1991. Nevertheless, Djibouti discreetly pursued Ise expansionism in Afar land,

[19] Not to be confused with *Somalian* territory.
[20] For instance, in October 1990, the Ethiopian army reported apprehending weapons transported by Ise nomads. They represented a weapon cargo disembarked a few weeks earlier at the port of Djibouti and coming from Iraq (Coubba, 1993, p.253). In another instance, when the Afar and Ise fought each other in Gala'lu in March 2002, it was claimed that Ise fighters were captured with Djiboutian identity cards on them, including some occupying high positions in the Djibouti National Army (Yasin, 2010, p.89).

on the other side of the Ethiopian border (Yasin 2010, p.88). As will be seen in the next sub-section, borders were also appropriated and used by the rural Afars and nations of the region alike to their advantage.

### 5.3.2 The rural Afar and the Ise Government in Djibouti

With Haj Hassan Gouled taking power in 1977 as the first President of the Republic of Djibouti, a new political future was in view for the newly born country. More pragmatically, the new president helped the Somali-Ise secure their dominance and power over the country. Not only did they gain in economic and political control, they also expanded the boundaries of the Somali-Ise territory inland (Yasin 2010, p.92). The Mamassan clan, part of the Ise tribe, held and maintained their supremacy over the Afars from that time onwards[21].

In 1977, soon after the power bases of political life in the young Republic were established, the Tadjoura district border was allegedly locked down while Obock and Dikhil districts were under control by Ise commissaries (equivalent to current day Prefects) installed in these regions. Following these measures, the commercial links between Tadjoura and Ethiopia diminished, choking the indigenous Afars of Obock and Tadjoura which, before 1977, represented 60% of local trade between the pastoralists in the hinterland[22] (Coubba 1993, p.193). Over the years, disappointment grew as the Afars (urban and rural alike) did not see any improvement of their conditions of living or any tangible or credible response to their aspirations.

The Afar community in the North and South-West of Djibouti were also going through difficulties of their own. Before the entry of the 'Front de Libération de l'Erythrée' (FPLE) in Asmara, the Afar used to live off the lands in both the Ethiopian and Djiboutian territory. However, with the birth of Eritrea, Afar land was divided up once again. Without being consulted, the indigenous Afar pastoralists now had to submit to three different administrations: Ethiopian, Djiboutian and

[21] Important ministries like defense, interior, national security, office of nationality affairs, foreign affairs, education, finance and national economy and the army are strictly in the hands of the Somali-Ise while the most powerful ones are shared between members of the Mamassan clan (Yasin, 2010, p.95, footnote 25; Coubba, 1993, pp. 179, 195, 200, 221-223).

[22] This Information was neither confirmed nor denied by other sources.

Eritrean. Meanwhile, on the Ethiopian side, the rich and green pasture lands of Awash Valley, inhabited by the Afars of the Kingdom of Aoussa, were sought after by both the Somali-Ise to the East and the Central Ethiopian Government. The Ethiopian government wanted the Oromo agriculturalists of the Northern Ethiopian plateau to exploit the land for agriculture. Hence, the Ethiopian government created the Awash Valley Authority Society which, backed up by the law, violently chased the nomads and their livestock out of the valley (Coubba 1993, p.281-284). Additionally, the Somali-Ise claimed those pasture lands on historical grounds as they used to roam over this valley for summer pasture. Under pressure, some nomadic Afar left the area to preserve their pastoral livelihood and roam over the surrounding arid ecosystems while some preferred to settle and switch to agriculture in order to stay and work the land.

As these injustices accumulated (in and around Djibouti) and bearing in mind the relative solidarity that existed within the Afar block of the Horn of Africa against outsiders, the after-shocks were mentally felt by the Afars of Djibouti as well. An increasing state of anger led to a violent uprising in 1991 in the context of an armed insurgency led by the *Front pour la Restauration de l'Unité et la Démocratie* (FRUD) against the central government of Haj Hassan Gouled. The military front was strong and, discreetly backed up by indigenous Afar pastoralists, it 'conquered' three quarters of the territory (Obock, Tadjoura and half of Dikhil district) within a few months while still allowing humanitarian organizations to help those most vulnerable and isolated. In front of such (popular) opposition, the Somali-Ise government used the defence accords signed on June 27th 1977 to justify France's needed military support, along with help from the Ethiopian[23] and Eritrean governments.

As for the Somali-Ise described in the above section, ethnic solidarity fervour among the Afar arose with "political, logistical and moral support [flooding] in to the opposition front from all directions of the Afar land. Afar young people including females joined the FRUD in order to end the Ise domination and intrusion" (Yasin 2010, p.92)

[23] FRUD fighters interviewed by Yasin corroborated that there had been intervention by the new Ethiopian People's Revolutionary Democratic Front (EPRDF) in the Djiboutian civil war conflict, as they sided with the Somali-Ise government of Haj Hassan Gouled (Yasin, 2010, p.92).

## 5.4 Reinforcing root causes' effects on vulnerability through time

The socio-political pressures studied in this section, namely the different impetuses behind population migratory trends (external and internal) and the different sources of conflict and their associated implications on rural areas, reveal the effective carriage of indirect impacts of root causes of vulnerability through time. The contradictions born out of the colonization process were being carried out and reinforced through socio-political pressures on pastoral life.

These dynamics of conflict and migration translate the acknowledgement of two separate realities that are paradoxically and simultaneously advantageous and limiting. On the one hand, the reality of borders and application of international law was advantageous as it protected the sovereignty of the State from external threats. The central government, now representing the centre of power, is the political organ in charge of administering the integrity of the State, its boundaries and the people living in it. Yet, on the other hand, the reality of ancient alliances and millennium-long cultural heritage shared by people across the region that used to protect the indigenous was now irrelevant to modern politics. Still, oral traditional histories remained a building block of one's identity in the Republic of Djibouti (and the region), meaning that many people would agree that 'although I am Djiboutian, I will still violate the integrity of the Ethiopian State to help another member of my tribe'. Such behaviour shows on one side, the alienated state of the people of the Horn of Africa (imposition of an exogenous State on a land supporting livelihoods heavily based on mobility and delimited by traditional rules of exchange and solidarity) and, on the other, the heavy influence of the colonizers' Westphalian perception of territoriality, passed on to the Djiboutian leaders of today as the government of Djibouti tries to help Ise expansionism inland and redefine its international borders.

Thus, there are two contradictory worlds at odds with each other and therefore two competing imaginations: the world of rural pastoralists, with their traditions, customary rights, values and perceptions of the land, and the urban world, with its set of rules, law and order, and openness to the opportunities offered by the modern economy.

At the local level, rural pastoralists are constantly at odds with the notions attached to the Nation-State, its limitations and its threats. The foundations of pastoral livelihoods are weakening and at stake. The very inputs of the pastoral livelihood system which are land (including water), livestock and the people are being affected. Increasingly vulnerable to environmental pressures, conflict and decreased mobility due to socio-political change, the effects of root causes carried through the dynamic pressures studied in this chapter had an impact on the capitals of the pastoral livelihood, particularly the human, financial and natural capitals[24]. Livestock was a medium of exchange once glorified, symbolic and a way to maintain contact and cooperation among tribes and people. Losing it meant losing part of their identity as pastoralists. In response, families rather risked de-structuring the family nucleus with some household members sent to search for work for the survival of the household, including the extended family. Income obtained through wage labour fed into the financial capital of the pastoral household and diversified their livelihood. In the face of recurring droughts, such adaptive strategies contributed to protecting the household's livelihood base by delaying or slowing down the pauperization process. Further, we are witnessing a gradual replacement of natural capital as the centrepiece of the livelihood by a more dispersed, more diversified livelihood in order to limit the risk of falling into food insecurity. Basically, by diversifying the livelihood base, one decreases its vulnerability to drought and therefore reduces the overall risk of falling into food insecurity by spreading it out among a greater number of types of capital.

In continuation with the centralization of socio-political life described above, the transition of the Djiboutian economy from a people's economy to an economy under the grip of external financial institutions is reviewed. Progressively, as pastoral life went through transformations and declined from 1862 to 1977, an ever-increasing distance was established between pastoral households and their control over the fate of their livelihoods. As socio-political life was being centralized with new rules, new power-relationships, new languages of exchange and cooperation, pastoralists saw the control over their own lives removed from the community-level and placed between the hands of far-away powers in Djibouti city. The next section examines how this trend was reinforced and exacerbated since the 1990s as Djibouti made its first steps into the world economy.

[24] Since pastoral livelihoods are very integrative, one cannot analyze the different capitals separately as they are all inter-linked.

## 5.5 Livestock commercialization and pastoral livelihoods

In the early days of the colonial period, as Burton reported it, strictly speaking, there were no villages in Northern Somaliland (Djama 1997). The first ones were founded at the beginning of the 19th Century mainly following both the creation of administrative posts inland by colonial powers (the French in the area soon to become the CFS) and the appearance of commercial counters quickly set up near water points around which transactions took place between buyers and sellers. This section reviews the effects of early livestock commercialization on local social relationships and pastoral livelihoods. It then proceeds to describe the more contemporary profile of livestock marketing in Djibouti and the Horn of Africa.

### 5.5.1 From a livelihood-oriented to a market-oriented pastoralism

Astonished by the quantity of untapped resources encountered through their frequent visits in the Horn of Africa, early colonizers sought to develop the unrealized export potential that livestock represented. The aim was to develop livestock resources in a sound and economic way by alleviating livestock development from what were considered as environmental pressures, namely lack of water and pasture land. Consequently, both the French and the British proceeded to improve the provision of water along nomadic/transhumance paths, extending veterinary services, providing capacity building in productive livestock husbandry, marketing strategies and techniques in grading livestock and livestock products. These efforts were more pronounced in present-day Somalia rather than in French Somaliland. They also invested in transportation in relation to both domestic and over-seas markets under the supervision of experienced technical staff to guide pastoralists (Konczacki 1967).

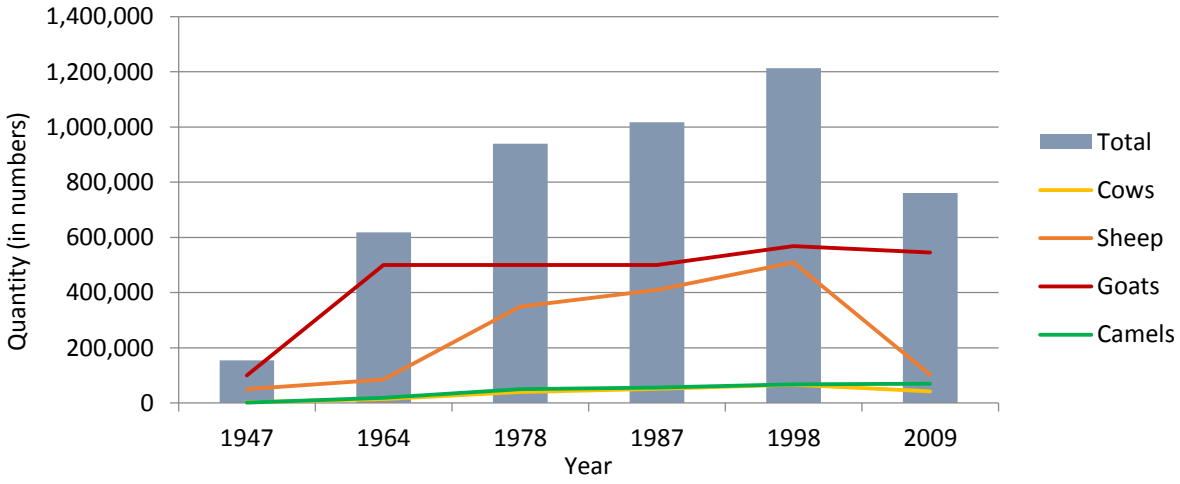
In both colonial settings, these measures (at different degrees) proceeded in manipulating natural checks on the practice of pastoral life. As the number of water points rose, combined with the construction of the railway, small villages started to appear in Chebele, Hol-Hol, Dasbiou and Ali-Sabieh. By removing natural checks on livestock rearing, the pastoralist would then be encouraged to sell his livestock rather than accumulating it as a strategy against environmental fluctuations.

However, what happened is that pastoralists, with the prospects of increasing both their physical, natural and financial capitals, proceeded in accumulating livestock in even greater quantities. Although in Somalia processes at work differed in terms of the challenges faced by pastoral households, those at work in Djibouti did not permit such concentration of livestock over the arid lands which might explain the short-lived after-effects of commercialization efforts.

- *Social impacts of commercialization*

The progressive appearance of marketing centres inland was accompanied by modifications in social rapports of production. On one hand, it signalled market penetration in the pastoral arena, contributing to the re-structuring of levels of notability within kinship groups based on financial status. On the other hand, the birth of local markets happened over lands delineated according to traditional ethnic guidelines and managed by different ethnic groupings (Djama 1997). Market centres represented new loci of competition between groups in the region. For pastoral groups, competition revolved especially around resource scarcity for the reproduction of the household and continued survival of their pastoral livelihood, while for those actors participating in the nascent commercial activities, the quantity and quality of livestock destined for export was economically at stake.

**Figure 5.1 Estimated number of livestock in rural Djibouti (1947-2009)**




*Note: Only data from 1978 are based on a livestock census. The data for the year 1998 are adapted from Kiambi, 1999. The data for the year 2009 originate from a rapid livestock assessment done by the MAPE-RH in 2009.*
*Source: Compiled by author from information in CRD and CRB, 2011, p.13.*

Consequently, different objectives for livestock exploitation were pursued in a harsh environment which contributed to an exacerbation of inter- and intra-tribal tensions exploited by the colonial administration. As pastoral households got increasingly tied into the forces of market exchange, the after-effects soon impinged on ecosystem services and the survival of pastoralism (Kapteijns 1995). These contemporary effects are now felt today. Overgrazing, over-use of water resources and demographic growth pressured natural resources as rural households increasingly settled around local market centres and water points. Also, capitalist exchange of livestock was unequal from the start since the goods pastoralists received in exchange for livestock were mainly goods for consumption rather than wealth generating instruments (Kapteijns 1995).

Scant livestock censuses do not permit us to analyse and distinguish between the effects of commercialization and those linked to environmental pressures exerted by animals on pasture. As shown in Figure 5.1, overall livestock numbers experienced a steady increase from 1947 to 1998 inclusive. It is suggested that this increase accompanied the progressive settling of pastoralists throughout these years[25]. As rural households settled near water-points while some family members still exercised transhumance albeit over lesser distances, livestock numbers progressively increased. Another reason might be linked to the fact that as environmental conditions for the practice of pastoralism were degrading, rural households tended to keep and accumulate as much livestock as possible. In the end, the overall increase was attributed to a combination of households' survival strategy and the removal of certain natural checks, namely uneven water access and animal morbidity and mortality. Nevertheless, these numbers must be approached with caution. There are difficulties inherent to the completion of such studies due to cross-border pastoral movement with their livestock. Therefore such numbers might mask the fact that an important number of animals included in the surveys actually emanated from neighbouring countries and transited through Djibouti to be exported.

- *Differential commercial value of livestock*

A few key characteristics of the different species of livestock that exist in Djibouti are exposed here. Different species require different needs which have to be satisfied based on the ecosystem

[25] This hypothesis is revisited more in depth in Chapter Seven.

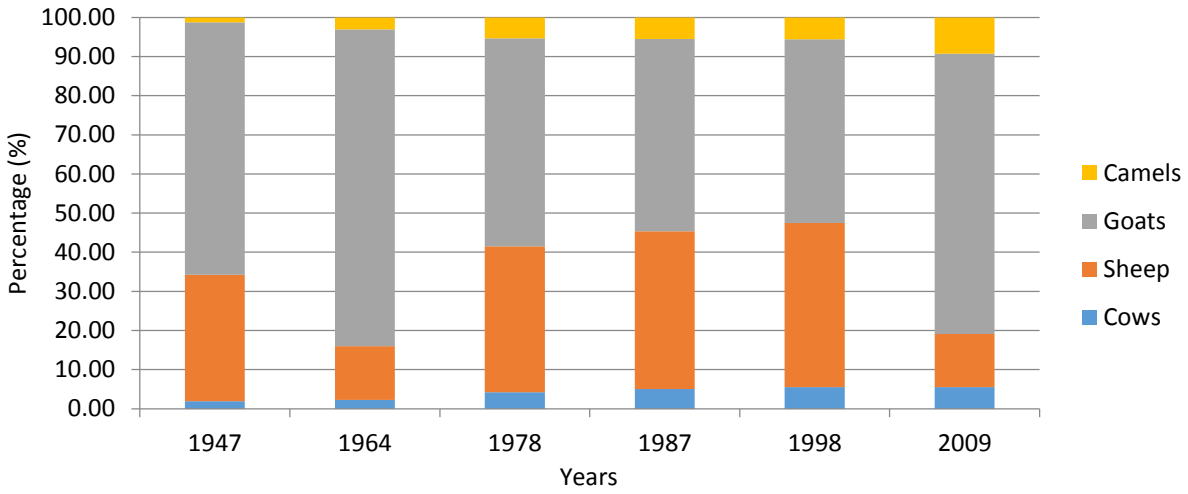
services provided by the environment: pastureland and water. These characteristics often determine the livestock composition of local herds as pastoralists try to cope with growing environmental pressures.

Cows: Traditionally, Djiboutian pastoralists are very attached to the symbolic nature of cows. They do not have much commercial value although they do provide important quantities of milk during longer periods of time than small livestock. It is a fragile animal that needs attention. Also used in funeral ceremonies and matrimonial exchanges, the exploitation of cows has greatly suffered from the progressive reduction in pasture lands.

Camels: Camels, noble and envied, used to have (and still does) a prestigious status as he facilitated transhumance (transportation), commerce and perfectly adapted to the harsh climate of Djibouti (Guedda 1989, p.12). Amongst pastoralists, the female camel is favoured for its milk production capacity while the male camel is ideal for transportation of heavy material in the case of transhumance and/or nomadic life. They are often used in caravan marketing in the carrying and exchange of goods between different places across national borders. Unfortunately, as transport facilities developed with the creation of roads, its use has drastically declined (Guedda 1989, p.14). Still, it remains crucial for contraband activities involving cigarette and *khat* smuggling in the region.

Goats and sheep: The rearing of these two species of livestock is logical in the inland arid context of Djibouti and with regards to the forage resources found in the environment. Apart from the North (Mount Goda and Mabla), goats form about half of the country's livestock, estimated at about a million heads. Producing one to two litres (l) of milk all year round, goats and sheep are generally found around encampments. They are more easily satisfied forage wise (especially goats) and very adaptable to difficult conditions. Their population can rebound very quickly compared to cows and camels and they contribute to a sizable portion of the livestock sector (milk, meat, skin, etc.) in Djibouti.

**Figure 5.2 Species composition of national Djiboutian livestock (1947-2009)**




*Note: Only data from 1978 are based on a livestock census. The data for the year 1998 are adapted from Kiambi, 1999. The data for the year 2009 originate from a rapid livestock assessment done by the MAPE-RH in 2009.*
*Source: Compiled by author from information in CRD and CRB, 2011, p.13.*

Sheep: In contrast to goats, they are found in lesser numbers as they require specific pasture land that is often far from encampments. More susceptible to heat than goats, they require much attention but they are valued for their reserves of fat. Although frequently exchanged and eaten at certain feasts during the year, pastoralists tend to keep their sheep and prefer to let go of goats in exchange.

Donkeys: Traditionally, donkeys did not represent any significant value to nomadic pastoralists. However, with growing water scarcity, settlement and greater distances between water points, they have become a unique resource to carry water cans, especially since women and children are responsible for fetching water in the household.

As shown in Figure 5.2 and given the ecological profile of Djibouti (especially in terms of the quantity, quality and type of pasture that is found in rural areas), Djiboutian pastoralists have tended to favour the rearing of both sheep and goats. It is seen that they made up 94% and 90% of all livestock in 1947 and 2009 respectively. Smaller, their needs are more easily satisfied (although the sheep's needs in pasture are quite specific) and their reproductive capacity allows them to easily reconstitute themselves. Nevertheless, the commerce of livestock in Djibouti is very local and still overwhelmingly for auto-subsistence because of disadvantageous terms of trade. In

contrast with their Somalian neighbours, Djiboutian pastoralists have not benefited from investments in livestock marketing infrastructure. The next sub-section shall determine why this has been the case and the nature of Djibouti's participation in regional livestock trade.

### 5.5.2 Regional livestock commercialization and the livestock sector in Djibouti

A 1984 study (Guedda et al.) on the contemporary state of pastoralism in Djibouti discussed the extent of livestock commercialization in the country. It concluded that the commercial livestock sector was nearly non-existent. This was in stark contrast with its neighbours (Somalia, Ethiopia and Eritrea) which, combined, are the biggest producers of marketed livestock on the continent.

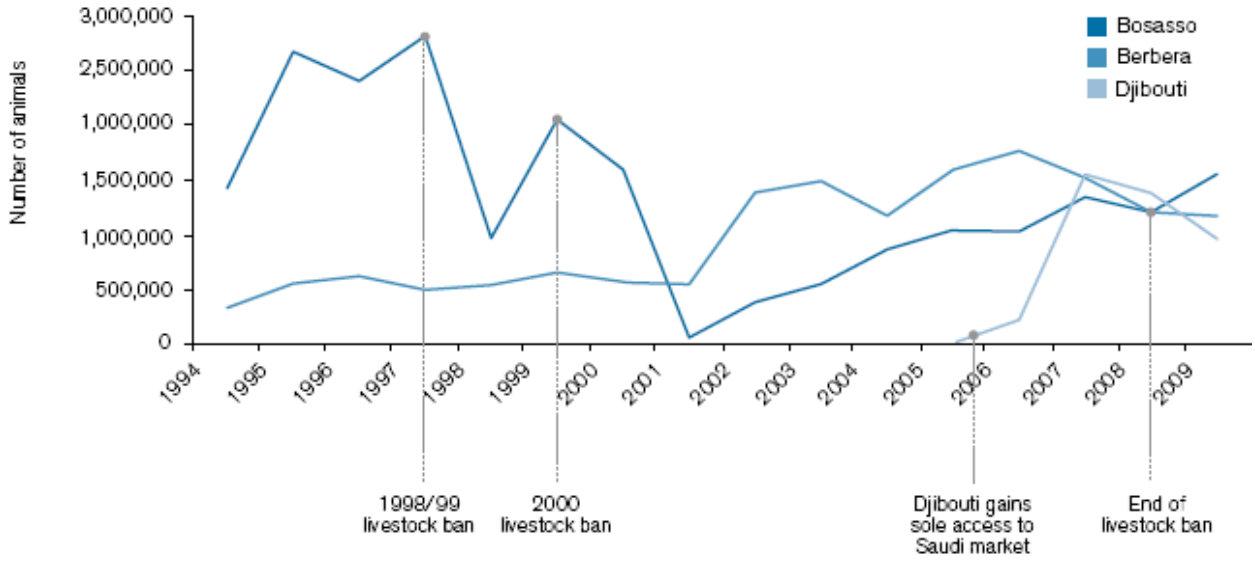
The selling of livestock was (and still is) occasional and solely involves small animals (goats and sheep) rather than the bigger ones. Djiboutian pastoralism is still very much practised for local subsistence rather than for exportation. It is saved, protected and used as a buffer against potential environmental fluctuations. Another reason lies in the survival of traditional rites (funeral and marital) which often require exchange and sacrifice of a large animal (camel or cow). As a result, the country is largely dependent on importation of meat since the livestock sector is very underdeveloped (Guedda et al. 1984, p.77-78, Brass et al. 2008). When it comes to assessing exportation of local livestock, it is very hard to distinguish between local and regional sources because of the lack of differentiation between livestock sources after screening at the Djibouti port and also simply because of the lack of sufficient data on livestock numbers.

There are three main difficulties impeding a successful exploitation of national livestock. Firstly, the dispersed nature of livestock mobility because of resource (water and pasture land) scarcity and the unpredictability of livestock productive levels impede the organization and sensible planning of returns on investments. Secondly, distances to be covered are very long, transportation costs are high, livestock management infrastructures are quasi-inexistent and local market prices fluctuate very rapidly. Thirdly, the selling price is too low and therefore they must invest more time and effort in livestock rearing than their Ethiopian and Somalian counterparts (FEWS-Net 2010). These reasons discourage the average Djiboutian pastoralist who, uncertain about the actual returns to investments, tends to separate himself from his livestock with great difficulty. Indeed,

there are no pasture lands close to market centres and, combined with the climatic difficulties of these past decades, the average household lacks the means to sell good quality livestock and often cannot compete with livestock originating from Ethiopia and/or Somalia. Although few local Djiboutian animals transits through the port (livestock is rather commercialized inland or at the border), the Djibouti Port's catchment area for camel and cattle extends into non-somali populated areas of Ethiopia and into the eastern part of the Horn of Africa (FEWS-Net 2007, Nisar 2010).

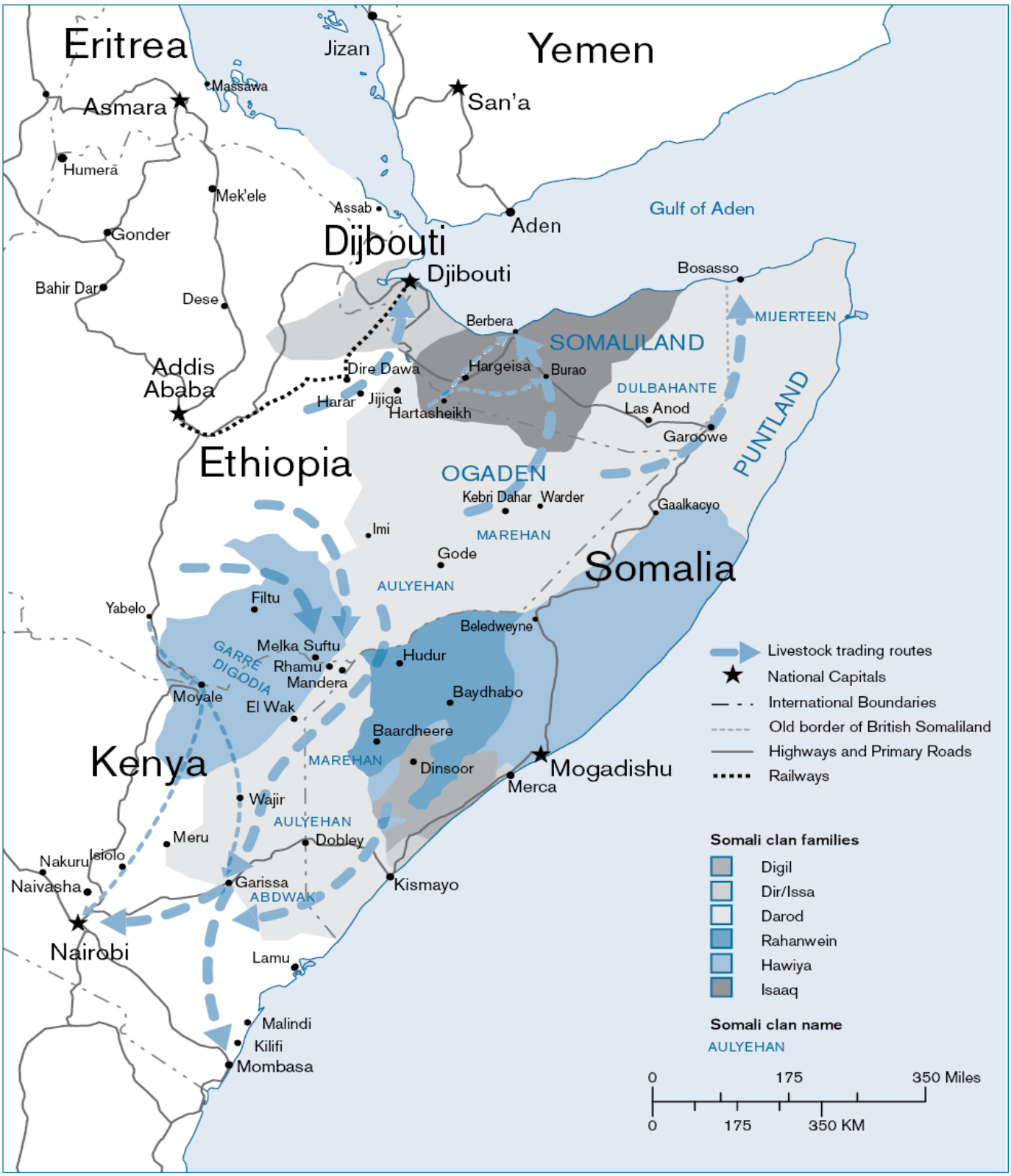
As shown in Figure 5.4, livestock trade in the northern Horn of Africa links Ethiopia, Djibouti, Somaliland and Puntland with each other, and with markets in the Arabian Peninsula and the Gulf. It involves the annual export of at least US$ 200 million worth of live animals through the ports of Djibouti, Bosasso and Berbera mainly from Ethiopia and Somalia (Nisar 2010). Figure 5.3 shows that at the regional level, Djibouti increasingly played a major role in the commercialization of regional livestock from 2006 onwards. The 1990s in particular saw the emergence of the Port of Djibouti as a major actor in the trade as the Ethiopia-Eritrea war (1998-2000) forced Ethiopia to shift the majority of its international trade from Assab (Eritrea) to Djibouti. In addition, the shift coincided with investment in Djibouti by Middle Eastern sources and the 2000 leasing agreement of the Djibouti Port to the Dubai Port Authority for 20 years (IMF 2001b).

**Figure 5.3 Livestock exports (sheep and goats) from Bosasso, Berbera and Djibouti (1994-2009)**




*Source: Nisar, 2010*

**Figure 5.4 Livestock trading routes in the Horn of Africa**




*Source: Nisar, 2010*

According to Nisar (2010), one major factor for Djibouti's success in livestock trade is due to the existence and enforcement of strict health regulations at the outset of live merchandise. Not only that, Djibouti is a stable and secure country and a major commercial stop for trade through the Bal-el Mandeb Detroit. As Djibouti continuously invested in Port facilities (and the recent Doraleh port) throughout the years, from 2006 onwards it profited from health related bans on livestock emanating from the Horn of Africa at the end of the 1990s and 2000s (see Figure 5.3). When Saudi Arabia, the main export destination in the region for livestock, imposed a ban on livestock originating from Bosasso and Berbera from 2000 to 2009, Djibouti established a Regional Quarantine Facility to provide quarantine and certification of animals before exportation. These measures enabled the Djibouti port to resume exports to Saudi Arabia in late 2006, enjoying sole access to the livestock market in the remaining three years (FEWS-Net 2010, Nisar 2010). The Somali-Ise in the Southern part of the territory cooperate with the Ise pastoralists living on the other side of the Djibouti-Ethiopian and Djibouti-Somalian borders for caravan contraband of various goods and internal trade (see Figure 5.4). Despite such cooperation, Djiboutian pastoralists are largely excluded from this trade and therefore rely more on remittances from tribal and family members working in the city for their financial capital. Thus, they were the least affected by the ban, especially due to increased export opportunities for Djibouti city and cross-border livestock movements between neighbouring countries and Djibouti city.

## 5.6 Djibouti's economy under pressure

With the help of France, Djibouti officially became a member country of the International Monetary Fund (IMF) in 1978, followed by a membership to the World Bank in 1980 (Houmed 2002). Weakened by the 1991-1994 war against FRUD's insurgents, the government turned to the IMF for help and signed a stand-by credit agreement of about US$ 6.7 million effective in 1996. It is officially the first use of IMF credit by Djibouti, the first of a long series of other agreements that would soon consume the new-born economy. The indirect aim behind this neo-liberalistic form of control was to change a people-oriented production for a national production system of goods sellable to industrial countries. This section briefly introduces the role of SAPs, the attached conditionality requirements and their impacts on the Djiboutian economy and pastoral livelihoods.

### 5.6.1 Djibouti and the IMF's structural adjustment programmes

According to the IMF and the WB, structural adjustment policies (SAPs) are "medium- to long-term (3-5 years) economic restructuring devices aimed at improving a country's economic performance and balance of trade situation" (Logan et al. 1993). The conditionality attached to the loans awarded through these programs comprised a list of policies that a member country must follow in order to have access to the Fund, i.e. if these conditions were not met, then the member country could not gain access to the financial resources of the Fund. The aim therefore was to, on one hand, ensure compliance of the State with the IMF's economic policies to be put in place and, on the other, to make sure the country would be in a position to repay the Fund in due time (Buira 2009).

As described by Jauch (2009), there are four main objectives that underlie the umbrella of measures to be implemented by individual countries under the SAPs. Firstly, governments are required to liberalize their economy and promote the free circulation of capital, goods and services combined with less tariffs and opening of national borders to international competition. Secondly, countries must favour and apply policies for the privatization of public services and companies. Thirdly, they must relax their control over labour relations and cut spending. Finally, they must improve their competitiveness on the international market (Jauch 2009).

**Table 5.1 SAPs' aims and their impacts on the economy of borrowing countries**

| SAPs objectives | Effects on the state economy |
|---|---|
| 1. To stabilize/adjust economies of countries with significant short-term difficulties with balance of payments | 1. Inflation, loss of control of money supply, and possibly capital flight |
| 2. Slowing the rate of growth of the money supply, government fiscal adjustment, wage restraint and spending cuts. | 2. Recession, growing income distribution and wealth disparities, decline of real wages, industrial concentration |
| 3. Liberalization of trade (lowering and/or simplifying tariffs), phasing out export initiatives to increase competition | 3. Inflation, unemployment, concentration of production, displacement of local producers and capital flight |
| 4. Privatization: selling off of parts of public sector, sub-contracting of existing public sector activities to private-sector entities or abandonment of those activities altogether to increase production efficiency | 4. Reduction in the role of the State, its efforts to produce goods and services directly reduced/undermined |

*Source: Compiled by the author from Biersteker, 1990.*

In line with the objectives stated in Table 5.1, the first of these measures requires the borrowing country to reduce the country's budget deficit through spending cuts, especially in the public sector. In line with this measure, key measures were introduced in Djibouti in 2000 and 2001 indicating major budget parameters to be changed, including wages, the number of government employees and expenditures on goods and services. The second measure has to do with liberalization of foreign exchange rules and trade which leads to deregulation of prices. This was applied in Djibouti, especially on petroleum and retail prices. Further, the government effectively eliminated barriers to trade and liberalized foreign exchange rules and trade.

### 5.6.2 Structural impacts on national and local economies

The SAPs had detrimental impacts on the overall economy of the Republic of Djibouti. However, in the context of this study, the section focuses on the economic effects relevant to rural livelihoods. In definitive, this sub-section tries to clarify the impact of SAPs on the strength of Djibouti's economy and, down the line, on pastoral livelihoods.

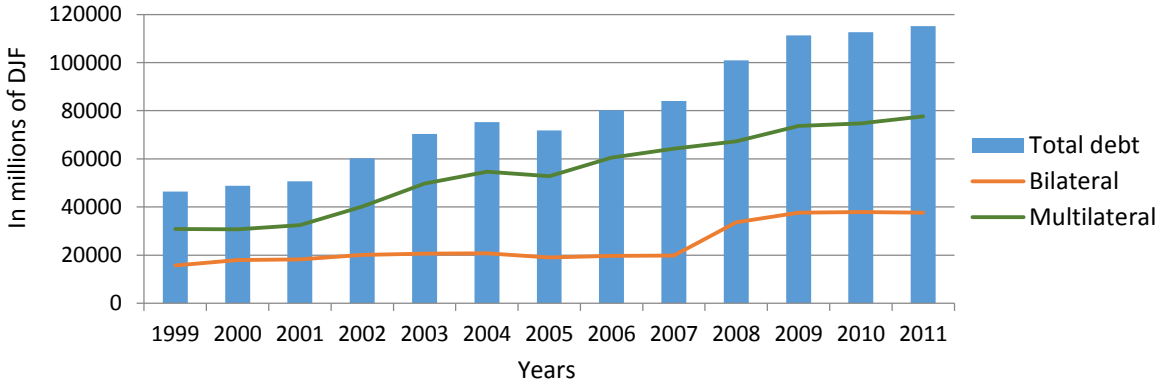
- *Debt: filling the 'Danaids' barrel*

Since Djibouti's first withdrawal of IMF funds in 1996, a set of increasing conditions has been choking the Djiboutian economy. As the State desperately tries to manage its budget deficits, payment arrears and external debt (see Figure 5.5), investment into development work for the masses of poor rural households was gradually but increasingly put aside.

In 1999, government multilateral debt accounted for nearly one-half of Djibouti's total multilateral debt without any arrears. This was mainly due to the large investments of the State in the military and defence systems in the context of the 1991-1994 war with the FRUD. Due to the low per capita income at the time, the government opted for financial assistance based on concessional long-term credit to foster reconstruction, development and economic growth. In addition, the government had assured the debt of certain public enterprises to certain multilateral creditors for which debt service was in arrears. An endless spiral of accumulated external arrears and external debt owed to both bilateral and multilateral creditors began and was kept alive by regular re-scheduling

agreements, with interest (see Figure 5.5). As Djibouti (both the State and public enterprises) was borrowing more and more to repay its total debt to the different creditors (with interest), the source of the problem was being compounded. Figure 5.5 shows a total debt amounting to DJF 116 billion, which, as shown later in Figure 5.6, represented about 53% of total nominal GDP in 2011 and an increase in the total amount by 132% in 10 years.

**Figure 5.5 Total, Bilateral and Multilateral debt (1999-2011)**




*Source: Compiled by the author from information contained in MEFPP, 2005 and DISED, 2012.*

To assess the nature of some of the measures implemented in rural areas, Table 5.2 indicates that a review of IMF documents concerning Djibouti was performed for four periods: 1999-2001, 2001-2005, 2005-2009 and 2009-2012. The results of this review are shown in Table 5.3.

**Table 5.2 IMF and Government of Djibouti sources of Table 5.3**

| Periods | IMF and Government of Djibouti reports |
|---|---|
| 1999-2001 | GoD 1999a, GoD 1999b, GoD 2000, IMF 2000, GoD 2001a, GoD 2001b, IMF 2001b |
| 2001-2005 | GoD 2001b, IMF 2001a, IMF 2001b, GoD 2002, IMF 2002a, IMF 2002b, GoD 2004b, GoD 2004c, GoD et al. 2004, IMF 2004a, IMF 2004b, GoD 2005 |
| 2005-2009 | GoD 2005, IMF 2007b, IMF 2007a, GoD 2009, IMF 2009c, IMF 2009b, IMF 2010 |
| 2009-2012 | GoD 2009, IMF 2009a, IMF 2011, GoD 2012 |

*Source: Author's research*

**Table 5.3: Socioeconomic indices and rural policies recorded in IMF documents for Djibouti, 1999-2012**

| Period | Economic Indices in rural areas | | Targets and Measures implemented in rural areas |
|---|---|---|---|
| | Positive | Negative | |
| **1999-2001** | None reported (apart from GDP growth of 1%) | - Consumer price index increase by 2.4% from Dec. 1999 to Dec. 2000<br>- Transportation prices increase due to oil prices increase<br>- High unemployment rate (44%)<br>- Negative real per capita growth | - Rural development (community pharmacies, livestock, agriculture)<br>- FAO long-term national agricultural development program (livestock/oasis agriculture)<br>- Food aid |
| **2001-2005** | None reported (apart from GDP growth of 2.7%[26] from 2001-2003) | -Overall extreme poverty incidence increase from 34.5 (in 1996) to 42.2% (in 2002) while incidence of relative poverty[27] reached 74.4% in 2002<br>- Rural poverty increase from 95% to 96.7% (relative poverty), 83% of which in complete destitution (extreme poverty)<br>- Decline in per capita income<br>- Consumer price index increase from 2% in 2003 to 3.1% in 2004<br>- Extremely poor rural access to primary education (12.4%)<br>- Low access to water (49.1%) | -Sale of assets of milk, livestock feed, spring water, and pharmacy enterprises<br>-Numerous projects in rural hydraulics undertaken<br>- Food aid |
| **2005-2009** | - GDP growth of 4.8% in 2006, 5.3% in 2007<br>- Benefit from some rural development program (pasture hydraulics + animal health program). | - Absence of recent data[28] on poverty but "poverty map show much [high] poverty rate in rural […] areas" (point 5, Djibouti-JSAN, 2009) and "large fringes of the population continue to live in difficult conditions of poverty and marginalization" (GoD 2009, bullet-point 24)<br>- Consumer price inflation increase from 3.5% in 2006 to 13.9% in 2008 | -Improving access to water and basic services for the poor<br>-Animal Health program, creation of feeding perimeters, diversification of economic activities<br>-Different programs giving access to basic infrastructure |

[26] According to an IMF Djibouti-Joint Staff Assessment, this growth was due to increased demand for services by foreign troops stationed in the country, revived Ethiopian trade through the Djibouti port and higher public investment rather than adoption of structural reforms (!). Yet, GDP increase remains modest because of limited progress in the privatization agenda and in reforming investment, commerce and labor codes.

[27] Extreme poverty is considered at US$1.8 per day (IMF, 2004a, bullet-point 7) while relative poverty is defined at US$ 3 per day in Djibouti (IMF, 2009a, bullet-point 5)

[28] Poverty monitoring has been hampered by lack of a population census and household surveys. The last census was carried out more than three decades ago and demographic statistics are based on the 1991 demographic survey (IMF, 2009a, bullet-points 5,7 and 24; GoD, 2009, p.4)

| | | | |
|---|---|---|---|
| | - Net primary school enrolment: 66.2%<br>- Proportion without access to *safe* drinking water: 15.9% in 2002 vs. 4.4% in 2006<br>- Increased access to safe drinking water to 52.5% | - 21.6% of accessed water points present a health risk (GoD 2012, p.19)<br>- Size of herds is 30-50% smaller than 2003 levels<br>- "There is every indication that the considerable increase in the inflow of FDI and the current strengthening of Djibouti's position as a transit hub have been of little benefit to [rural] people." (GoD 2009, bullet-point 24) | -Improving rural incomes and reducing incidence of extreme poverty<br>-Protection of biodiversity<br>-Ensure availability of sufficient water (PROMES-GDT – 2008)<br>- Food aid |
| **2009-2012** | -Commendable efforts in water projects, but limited impact<br>- Access to primary and secondary education increases compared to 2001-2005 period with 41.3% and 18.1%, respectively | -Absence of recent data but "large segments of the population continue to live in difficult conditions of poverty and marginalization" (GoD 2012, pp.3, 7)<br>- Rural relative poverty near 95%<br>- Literacy rate and Infant mortality rates: "rural areas lagging far behind" (p.7, 15, PRSP, 2012) (GoD 2012, pp.7, 15)<br>- "There is every indication that the considerable increase in the inflow of FDI and the current strengthening of Djibouti's position as a transit hub have been of little benefit to [rural] people." (GoD 2012, p.7) | -Subsidizing food and fuel prices to mitigate their impact on population<br>- Public Investment Program (PIP) underlying the INDS from 2008 to 2011, with 1/5 financed domestically and the rest externally financed<br>-Stabilization of fuel prices (diesel and kerosene)<br>- Food aid |

*Source: Author's research from IMF documents, 1999-2012*

**Table 5.3 continued**

Overall, Table 5.3 indicates that despite the IMF and WB's presumptions that their measures would improve the socio-economic situation, the evidence for rural Djibouti is that there has been little improvement in most socioeconomic indices. From 1999 to 2012, poverty statistics remained dreadfully high and has hardly changed at all. Two reasons are proposed to explain this. Firstly, as admitted by the IMF itself, the increase in the inflow of Foreign Direct Investments (FDIs) and the current strengthening of Djibouti's position as a transit hub were of little benefit to rural household (GoD 2012). Secondly, the review of IMF documents showed that there has not been enough development intervention to restore or rehabilitate pastoral livelihoods.

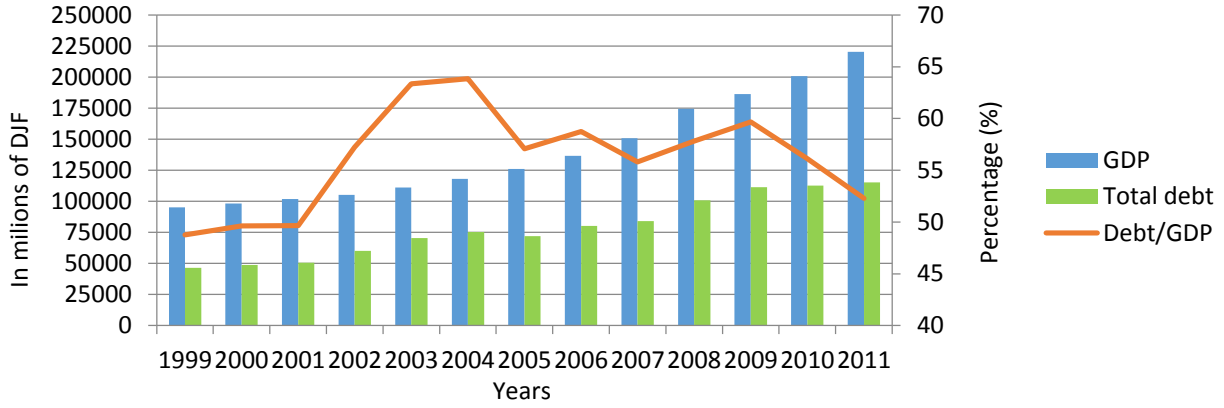
In the education sector, a positive overall trend in school attendance was recorded from the 1990s onwards. The overall gross school attendance rate went from 38% in 1990/1991 to 40% in 1999/2000. However these numbers masked contrasting rates in rural areas where only 17.3% (amongst which 8.3% of girls) of the population were attending a school (GoD 2001c, p.15-16, MHUEAT 2001, p.18, GoD 2004a, p.2). Other reports indicate that the illiteracy rate among the sample reached 71% and 97.3%, respectively for urban and rural women (GoD et al. 2003, pp.16, 20). These numbers can be explained by the nature of pastoral livelihoods which required the participation of children in keeping livestock (especially goats and sheep). As a function of various dynamic pressures, the livestock configuration of pastoral households changed in the last few decades as it progressively relied more on products (milk, meat, etc.) extracted from goats and sheep rather than cattle. As a result, participation of children and women in livestock rearing increased. During the 2009-2012 period, a positive trend was finally recorded with rates of school attendance reaching 41.3% in rural areas (GoD 2007, p.17). Unfortunately, there are no recent data on school enrolment rates, and much less that discriminated between rural and urban areas[29].

With regards to the economy, Figure 5.6 indicates that debt represented a significant proportion of nominal GDP (between 49 and 63% across the 1999 to 2011 period). A sharp rise in debt occurred between 2002 and 2004 which was, according to a development adjustment assessment report for the 1999 to 2004 period, due to a surge of loans contracted from financial institutions such as the

[29] In 2009, the illiteracy rate for those 15 years and over was 52.6%, for those between 15-24 years was 72.7%. For children aged 6 to 10 years old, 87.9% of them were enrolled in school (88.6% for boys and 87.1% for girls) (DISED, 2012, p.27)

World Bank (WB), the African Development Bank (AfDB), the Islamic Development Bank, the Organization of Petroleum Exporting Countries and others (MEFPP 2005, p.35). External financing was generally in the form of loans (sometimes reaching up to 73% of total external financing) and, as a reflection of this situation, a very large part of the total debt burden (up to 75%) was owed to multilateral lenders.

**Figure 5.6 Debt as a proportion of Nominal GDP (1999-2011)**




*Source: Compiled by author from information in MEFPP, 2005 and DISED, 2012.*

In addition, the part of the economy that is usually targeted by such external investments in developing the country (called Public Investment Programmes (PIP)), is the social one, which regroups amongst others, the agricultural, livestock, environment and water sectors. This never-ending cycle and self-reinforcing process led to a shortage of agricultural, livestock and industrial inputs, further reducing productivity and the ability of the country to pay back its debt. In order to make these payments, the State invested in sectors yielding the most returns to investment which were, in the context of Djibouti, the tertiary sectors (services), and more specifically the Port of Djibouti. More importantly and at a decreasing rate, interest payments were not allowed to get into arrears by international lenders (IMF, WB, IBD, AfDB, etc.) and thus these payments progressively took priority over purchases of food and investment in livestock. The insidious pressure behind payment allocation is well-explained in the following quote:

> "Disapproval by the IMF of a country's economic policies can lead to a denial of public and private international credit and development aid, since multilateral development banks, aid agencies, and private banks defer to the IMF seal of approval. While many countries might be better off if international

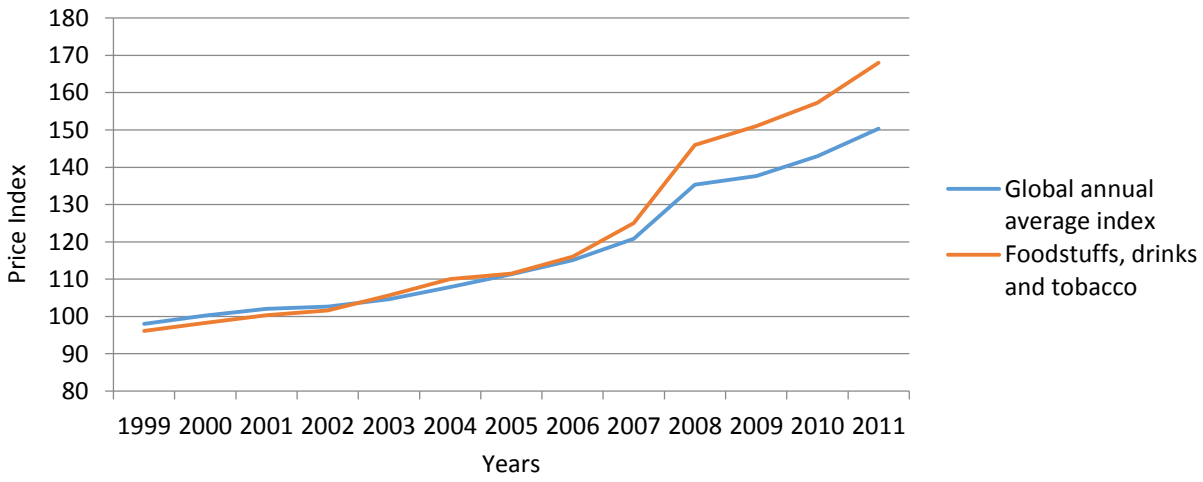
borrowing, particularly short-term borrowing, were significantly reduced, a complete withdrawal of credit can shut down otherwise functioning enterprises." *(Naiman et al. 1999)*

In the end, most policy reforms and the debt burden reduced the State's attempts at distributing (and redistributing) both the social and/or private product of capital among the population. Down the line, it meant that pastoral livelihoods did not benefit from the country's economic policies.

- *Pastoralists and access to essential foods*

Given its harsh socio-environmental context and its lack of natural resources, Djibouti imports over 90% of its food products which makes it highly exposed to price fluctuations (UN 2013, p.12). International and regional price oscillations of essential foods have therefore direct effects on the accessibility to essential nutrients by pastoral households.

**Figure 5.7 Consumer Price Index in Djibouti (1999-2011)[30]**




*Source: Compiled by author from information in DISED, 2012, DISED, 2007 and DISED, 2003.*

The contextual changes that occurred in the past two centuries (including the implementation of neo-liberalistic policies in Djibouti and its neighbours) resulted in an increased inter-dependency between Djibouti's national economy, its neighbours' and international market forces. As the effects of aridity periods are currently more felt than ever before, the price of foods, strongly linked

[30] One must bear in mind that prices in the capital are slightly higher than in markets located in the Districts from which a great proportion of rural households also get their foods.

to the production and productivity levels of neighbouring supply countries (agriculture in Ethiopia and livestock in Somalia, Eritrea and Ethiopia) constantly increased (Figure 5.7). As the role of the State in the economy was reduced, there was greater reliance on market mechanisms with the liberalization of trade and concomitant disappearance of barriers to trade (Biersteker 1990). As a result and as confirmed in Figure 5.7, an increasing trend in the overall price index and, more importantly, in the price of foods index ensued.

At the end of the year 2007 and beginning of the year 2008, there was a sudden sharp rise in the price index of foodstuffs from 125 to 146 and increasing up until 2011. Between 2005 and 2008, the price of rice, oils, milk (which is imported) and flour respectively skyrocketed by 50%, 73%, 46% and 38%. This is partly explained by the 'drought' that hit the region in those years with its impacts on both the agricultural and livestock sectors in the Horn of Africa region (UN 2013, p.12). Apart from isolated products such as wheat flour (internally produced to stabilize its price) and basmati rice, world food prices were drastically increasing with, in 2011, food oil and untransformed staples contributing to 82% of the overall increase in the food price index. Due to the pressures related to inflation, rural households' expenditures plummeted in dollar terms to an average of 91.9 DJF ($US 0.51) per person per day. The WFP found that in 2013, 69% of rural households' expenditure baskets were dedicated to food[31]. As a result of this economic pressure, rural households (including nomadic pastoralists) had to reconfigure their consumption habits which consisted mainly in reducing quantities of food consumed, buying less preferred foods that are cheaper as well as other strategies putting their livelihoods at risk[32] (WFP 2013, p.17).

- *Rural households' livelihoods on the margins*

As the economy was undergoing drastic changes due to national budget difficulties through the 1990s, Djibouti progressively established tighter ties with external economic partners comprising both bilateral (other countries) and multilateral (international financial institutions) actors. As seen

[31] This value varies greatly between 48% for those households in food security and 82% for those in severe food insecurity. During the week prior to a 2013 survey by the WFP, 81.8% of rural households had moments when they did not have enough money to buy food (WFP, 2013).

[32] For instance, 23% of households had to sell unusual amounts of livestock in the last six months prior to one study by the WFP in 2013 and 11.3% of rural households had sold some of their productive animals in the last 30 days prior to that same survey (WFP, 2013, p.17).

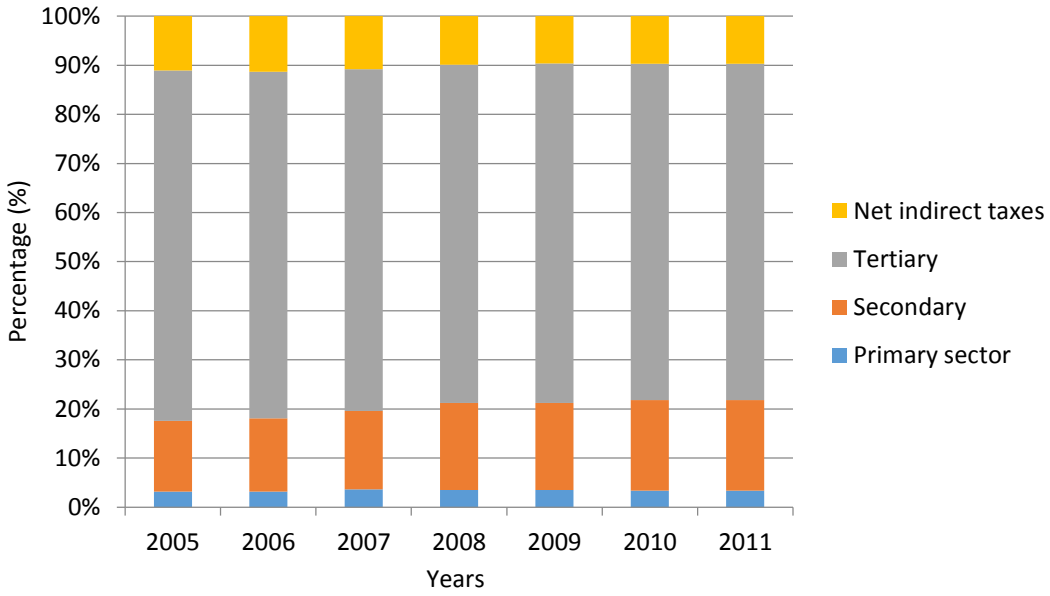
in the previous sub-section, most investment loans emanated from multilateral actors and, the higher the amount disbursed the tighter and more stringent the conditions were (Buira 2009). The marginalization process of rural households (and pastoralists) took place at the highest level and then translated into detrimental effects on rural pastoralists' lives at the bottom.

The marginalization process of rural households in the post-independence period began with the absence of representatives of these zones in discussions on economic policies taking place between the State and international institutions. It was reported that in a number of countries, the involvement of national parliaments in the formulation and submission of Poverty Reduction Strategy Papers (PRSPs) was limited, especially in Africa. Given this, it is perhaps not surprising that women were generally excluded from the process. More importantly, the poor and the most vulnerable were not consulted and not well represented (Stewart et al. 2004). In the context of Djibouti, this lack of inclusion increased the distance between pastoralists and the State which manifested in an extremely weak degree of control by households over their lives. Although this problem was already identified by government officials over a decade ago (GoD 2001c, p.32), pastoral households continued to be left out of discussions over government initiatives taking place both at the national level and in rural areas[33]. For instance, the rare social studies completed by the State have frequently excluded households from rural areas and even more so in the case of nomadic households (GoD 2001c, p.16, GoD et al. 2002, p.62).

In terms of investments taking place in rural areas to alleviate pressures on rural life, there is an enormous disincentive from the start. Djibouti is deprived of productive natural resources and therefore presents a rather weak primary sector in terms of both its production and productivity levels. As exemplified in Figure 5.8, the contribution of the agricultural, livestock and fishing sector barely reaches three percent of the national nominal GDP, which is very small compared to the tertiary sector (about 70%), mainly composed of dividends emanating from Port activities.

[33] The reality of this problem was confirmed by respondents and is discussed in Chapter Eight.

**Figure 5.8 Contribution of different sectors to the Nominal GDP (2005-2011)**




*Source: Compiled by author from information in Djiboutian Government records, IMF documents and DISED, 2012.*

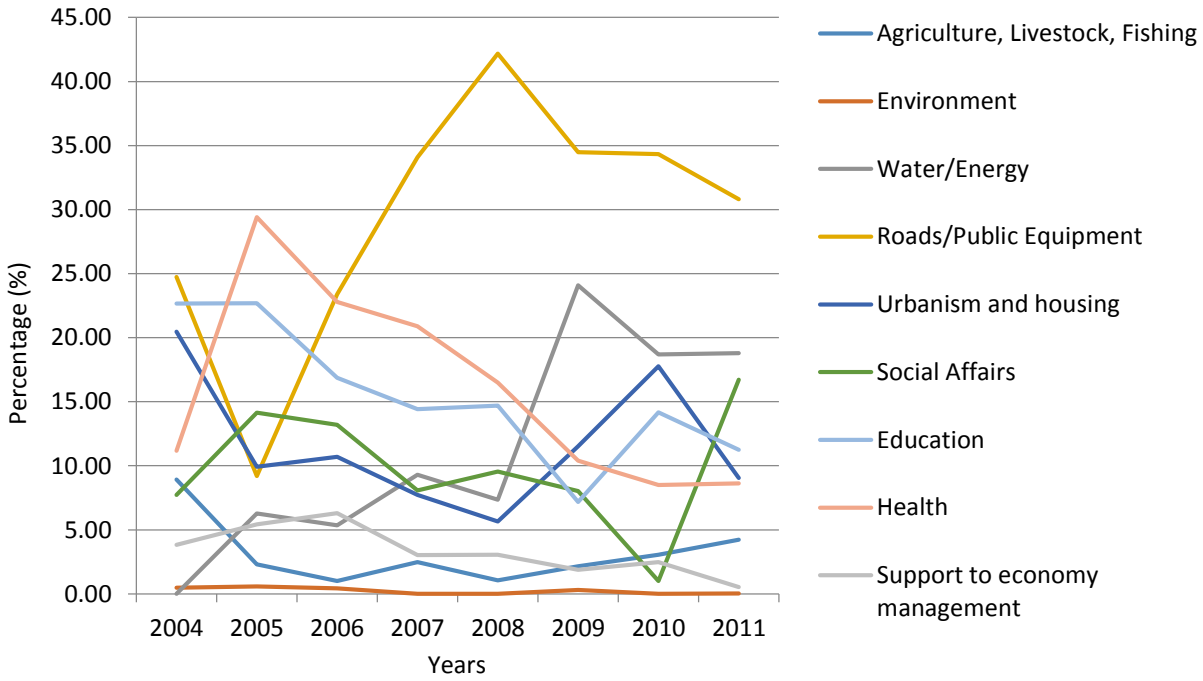
The State, in debt and seeking economic productivity and growth at all costs because of the promises made as part of negotiations with various lending agencies, relegated those named sectors to the background. This is exemplified in the following IMF communication dated 2001:

> "The adoption in early 2002 of a plan to repay gradually the entire stock of budgetary arrears, following an audit of those arrears, as well as additional transparency in public sector operations will be important steps toward *restoring credibility* (emphasis added) in government operations. The steadfast implementation of the recently adopted privatization strategy together with the streamlining of preferential tax systems will contribute to a durable improvement in the business climate and growth prospects in general." *(IMF 2001a, p.1)*

The effects of such policy impositions then influenced the nature of sectorial investments by the State and external financing bodies in the following years. As shown in Figure 5.9, the environment and the agriculture/livestock/fishing sectors are among those with the least investment, with proportions ranging from zero to eight percent at best between 2004 and 2011. This graph shows very clearly how undervalued the primary sector (agriculture, livestock, fishing and environment) is compared to the secondary sector (roads/public equipment, water/energy and housing). This is of course partly explained by the fact that contrary to most African countries, Djibouti is a very

urbanized country with over 76% of its population concentrated in the capital. Yet even these investments in urban areas have had limited impacts on people's welfare as there are vast portions of the population still living in grave sanitary conditions (Chiré 2012). And evidently, the fact that less than five percent of the budget was spent on agriculture when about a quarter of the population are still rural is highly problematic.

**Figure 5.9 PIP proportions by sector of intervention (2004-2011)**




*Source: Compiled by author from information in DISED, 2012.*

For example, in the livestock sector, apart from a livestock park built to improve the management of animals to be exported to develop the livestock sector, no real tangible and long-lasting initiatives to alleviate drought's impacts on rural livelihoods and to assist those most affected in a livelihood transition took place. There are three main limitations to its development. Firstly, its competitive edge is very small compared to neighbouring Ethiopia, Eritrea and Somalia. Secondly, as we will see in the environmental pressures section, Djiboutian rural lands are exhibiting the signs of an engrained desertification process which reduces and undermines pastureland regeneration and forage resources. As it recedes, the top soil is eroded and gradually disappears, which undermines effective water infiltration and augments surface run-off, further impacting both

the deeper soil and underground water sources. Thirdly, Djibouti suffers from the lack of adequate infrastructure for the reception and management of livestock (Brass et al. 2008, p.14). Agriculture as an alternative or ancillary practice is rather recent in Djibouti (last three decades) due to the fact that rural populations are traditionally pastoral. In addition, similarly to pastoralism, crop cultivation is very challenging because of the arid climate and also because of the high cost, technicality and maintenance difficulties associated with irrigation infrastructure. These challenges may thus explain the low investments that are made in the primary sector through the PIPs.

Last but not least, the marginalization of rural households is indicated by the social statistics describing the level of education in rural areas. One absolute defining factor of integration for a pastoral household is to have at least one of its members that is literate. This defining element is crucial, not only to navigate through the obligations and administrative traps of urban life, but also to merely find a job that is more or less well paid as part of the pastoral livelihood diversification process. In addition, literacy is power (and vice-versa where illiteracy is lack of power) in the urban socio-political life that sprung out of the colonial period. It is a medium through which one can have a voice with claims that can be heard. It is a pre-requisite not only to stay informed (although a lot of information is also orally shared during group discussions around *khat* sessions and/or family reunions) but also to be more competitive in the search for jobs. It is a skill that is now valued in the human capital of a pastoral household. Unfortunately, the lack thereof is also a manifestation of a state of marginalization.

## 5.7 Conclusion

This chapter has reviewed several dynamic pressures with reinforcing impacts on pastoral livelihoods.

Firstly, there were (and still are) two contradicting worlds at odds with each other and therefore two competing imaginations: the world of rural pastoralists, with their traditions, customary rights, values and perceptions of the land, and the urban world, with its set of rules, law and order, and

openness to the opportunities offered by the modern economy. Competition over resources, national aspirations of the Governments of Djibouti, Ethiopia and Somalia fed regional tensions and conflict between the Afars and the Somali-Ise. Combined with migratory flows from rural areas to the city, these pressures have redefined their perceptions of the world and encouraged them to enter into modernity.

This entry took place subsequently to failed attempts by the colonial administration to commercialise livestock and occurred regardless of rural pastoralists' aspirations and difficulties. As Djibouti became independent and obtained financial help from international institutions, its economic policies became increasingly influenced by the IMF and the WB. The directives implemented under their guidance did not decrease the vulnerability of pastoral livelihoods. On the contrary, it was seen that despite being part of the Djiboutian population, pastoralists were marginalized and their structural needs not addressed.

As a result, the combination of these pressures forced rural households to reconfigure their diminishing livestock profile and to diversify their food and income sources. Rural pastoralists had to devise ways to survive and preserve their livelihood, one of which was sedentarization. Before discussing this phenomenon in Chapter Seven, the next chapter explores the nature of climate variability and discusses the concept of 'drought' as a hazard in the context of rural Djibouti.

# 6 Investigating climate variability dynamics and drought

## 6.1 Introduction

To understand the inter-relationships between drought itself and vulnerability to drought, there needs to be a clearer understanding of climate variability dynamics. Thus, the aim of this chapter is to answer the fifth research sub-question stated in Chapter One and reiterated here:

- What are the climate dynamics behind the occurrence of droughts in Dikhil region?

To address the aforementioned sub-question, the chapter analyses the particular climate of Dikhil region, discusses the factors of drought occurrence and assesses the claim that there was a downward trend in rainfall precipitations in Dikhil region in the recent past. As stated in Chapter Two, food insecurity risk is a function of drought, pastoralists' vulnerability to it and their adaptive capacity to climatic fluctuations.

This chapter specifically focuses on the hazard (drought) component of the equation. It is suggested that an understanding of the ways in which lack of rainfall manifests in Dikhil region can shed light on distinctions between real and assumed vulnerability to drought. The chapter is divided into two major parts. The first section discusses secondary data on the understanding of drought in Djibouti based on reports and relevant studies, the literature on climate trends over the Horn of Africa (HoA) region and Dikhil region's climate. The second section introduces, analyses and discusses climate patterns and rainfall trends specifically in Dikhil region and rural Djibouti based on quantitative and qualitative data about rainfall and pastoralists' interpretation of climate. It also includes a comparison between rainfall data and pastoralists' perceptions of rainfall behaviour.

As in Djibouti, a number of least developed countries (LDCs), especially in Africa (including the GHA), are burdened with the lack of high-quality data which is often correlated with lack of research capability in related data-based field research (Shongwe et al. 2011). In particular, limited availability of long records of daily climate data hampers rigorous research on climate variability, climate change and the frequency and intensity of extreme events in relation to impacts on local livelihoods (Omondi et al. 2014).

In Djibouti and Dikhil region in particular, the unavailability of data is driven by severe underfunding, inadequate monitoring controls, and resulting gaps in the records. Fieldwork for this research also showed that aside from the meteorological station in Djibouti City, there are no functioning meteorological stations today in rural areas. These past stations had been destroyed during the 1994 civil war. Other reasons might include processing and quality control issues as well as outdated data policies. An examination of a range of reports and studies in Djibouti indicate that direct weather station rainfall records for Dikhil region extend only from 1960 to 1990 (Mohamed 2006). These deficiencies (and especially the absence of weather stations) undermine adequate drought monitoring and understanding of rainfall patterns in the ASALs which are known to exhibit great spatial and temporal variability (Omondi et al. 2014).

Djibouti's insufficient rain gauge networks and the lack of weather stations in rural areas undermine the production of real and reliable areal estimates. In addition, the use of radar is very costly, requires technological infrastructure and can often present topography issues associated with the use of radar data (Grimes et al. 1999). To circumvent the issue of data unavailability, rainfall estimation algorithms based on satellite imagery were used in the last 30 years. Since studies have shown that there is a strong correlation between vegetation cover, surface temperature data and precipitation patterns, satellite remotely sensed visible and infrared reflectance measurements are frequently used to monitor long-term changes in the Normalized Difference Vegetation Index (NVDI)[34] for the production of drought monitoring indices (Galvin et al. 2001, Choi et al. 2013). The imagery is generated by geostationary satellites such as METEOSAT which

[34] Yet, caution must be observed in using NDVI data. Findings from one recent study by Choi et al. (2013) which contrasted the NDVI data with normalized difference water index (NDWI) data found that the latter provided more statistically meaningful information than the former; it suggests that NDWI would therefore be a more accurate drought indicator for the ASALs of the HoA (Choi et al., 2013).

have proven quite useful since they are able to produce imagery at a high temporal frequency and at a low spatial resolution (few kilometres) from which rainfall amounts can then be deduced (Grimes et al. 1999).

Due to lack of quality rainfall data, it required much effort to find, collate and analyse satellite imagery data for Dikhil region and the HoA. Through its Advanced Real Time Environmental Monitoring Information System (ARTEMIS), the Food and Agriculture Organization of the United Nations (FAO-UN) exploits low-resolution satellite remote sensing data to monitor vegetation cover changes as well as rainfall behaviour over various areas around the world since 1988 (Minamiguchi 2005). In turn, these data are fed into the Global Information and Early Warning System (GIEWS) database[35] on food and agriculture with the use of near-real-time satellite images from METEOSAT. These proxies for rainfall such as decadal and monthly rainfall data for Dikhil region from 2007 to 2013 used in this research are combined with NDVI information to provide the GIEWS with drought monitoring data (Minamiguchi 2005). Thus, the analysis of Dikhil region's climate for this study was based on rain gauge data obtained from the Meteorological station in Djibouti city for the 1956-1966 period and decadal and monthly satellite imagery data collected from the GIEWS database for the 2007-2013 period.

However, caution must be observed in the use of satellite imagery data. In the absence of real-time recorded data, the use of geostationary satellite imagery for rainfall estimation has its limitations due to the fact that its sensors do not directly detect and register actual rainfall *per se*. The pre-defined algorithms expressing rainfall rate as a function of observed quantities vary in time and space according to the calibration parameters they are based upon. As a result, the use of monthly and decadal rainfall data from the GIEWS database to study Dikhil region's climate may overlook the possibility of changes in the number of rainy days and intensity of rainfall with a single shower, potentially masking seasonal rainfall patterns. In order to yield more accurate results, regularly calibrated proxies against various environmental variables would be preferable (Grimes et al. 1999) which is highly challenging. Although it is a useful substitute to real data on actual rainfall patterns, it is important to bear in mind that satellite imagery can unfortunately misrepresent real-time climatic trends.

[35] The data can be accessed for free at the following link: http://www.fao.org/giews/english/ierf/list.asp?code=70

## 6.2 Discussing secondary data on climate and rainfall patterns

### 6.2.1 Defining drought in Djibouti

There is often confusion over the differences between a drought, a prolonged period of aridity and dry spells. In the literature, drought is broadly defined as a "recurring extreme climate event over land characterized by […] a temporary [below-normal precipitation] period, in contrast to the permanent aridity in arid areas [and can] occur even in wet and humid regions" (Dai 2011). Overall though, there is no unified conceptual definition of a drought since its contours and understanding are very much determined by a set of thresholds that are often arbitrarily identified (Meze-Hausken 2004). Drought perception depends upon the nature of its impacts on water availability and changes according to its use.

The literature distinguishes between four main types of drought which can be meteorological, hydrological, agricultural and socio-economical with emphasis on a set of variables such as rainfall deficit, low-flow characteristics, soil moisture or urban water supply (Kurnik et al. 2011). Meteorological drought is defined by abnormally low precipitation whereas agricultural drought is defined in terms of water requirements for crop production. Hydrological drought refers rather to lower than normal soil water content which then influences both soil formation processes and the hydrographic network. This type of drought tends to occur after a prolonged period of meteorological drought (Choi et al. 2013).

As specified in Chapter Two, it is reiterated here that this research focuses on inter-relationships between factors of vulnerability and 'meteorological' drought. This drought type is a translation of a negative rainfall anomaly and is therefore usually defined in terms of percentage reduction in precipitation from an average which can be annual or seasonal. Consequently, its definition (and thresholds) can differ from country to country (Meze-Hausken 2004) and lead to confusion over its use in regional drought appeal reports, national action plans and so forth. In Djibouti, there is no real definition of drought that has been adopted (CRD et al. 2011).

Given the recurrent nature of droughts in Djibouti and the disaster risk perspective adopted by this study through the use of the PAR model, its definition must describe an *abnormal* drought for it to be considered as a hazard. Thus, this study considers that (abnormal) drought in the specific context of Djibouti corresponds to the completion of six or more rainy seasonal cycle(s) with precipitation levels that are below 50% of the previous 10-year average[36]. This definition is therefore dynamic (non-constant) and takes into account the possibility that unusual climate fluctuations may gradually stabilize and 'normalize' in time and space.

### 6.2.2 Climate patterns in Djibouti and the Horn of Africa

Bearing in mind that there is little evidence concerning the successful livelihood recovery of rural households following the 1980s drought in the GHA, recent studies suggest that continued drying may have occurred well into the 2000s (Seleshi et al. 2004, Williams et al. 2012). There is a relative consensus in the literature that in the last two decades, the frequency and intensity of droughts have increased in Africa which combined with the occurrence of vegetation degradation, adversely impacting the rangelands of Ethiopia, Kenya, and Somalia and thus causing the Horn of Africa to become one of the world's most food insecure regions (Sheik-Mohamed et al. 1999, Pricope et al. 2013).

Most documents written on the subject indicate that the Horn of Africa is prone to recurrent drought events, with the last one (2011-2012) being the "worst in the last 60 years" (Brown 2011), contributing to sharp increases in food prices and child malnutrition (Chevallier 2011, Williams et al. 2012). However, these claims are not necessarily by evidence showing homogenous decreasing and increasing patterns in rainfall and temperature data, respectively, across geographical scales. This section evaluates the significance of these climatic trends in the HoA.

As shown in Table 6.1, five out of nine studies state that they found significant decreasing trends in precipitation indices in the last 14 to 62 years.

[36] The 10-year average was chosen because respondents indicated that drought could last from three up to five years. Consequently, the maximum period required for normal rainfall (temporally wise and in quantitative terms) to resume is five years. Adding up both periods therefore yields a minimum observation period of 10 years in the past.

**Table 6.1 Review of recent regional precipitation and temperature trends in Djibouti and the Horn of Africa**

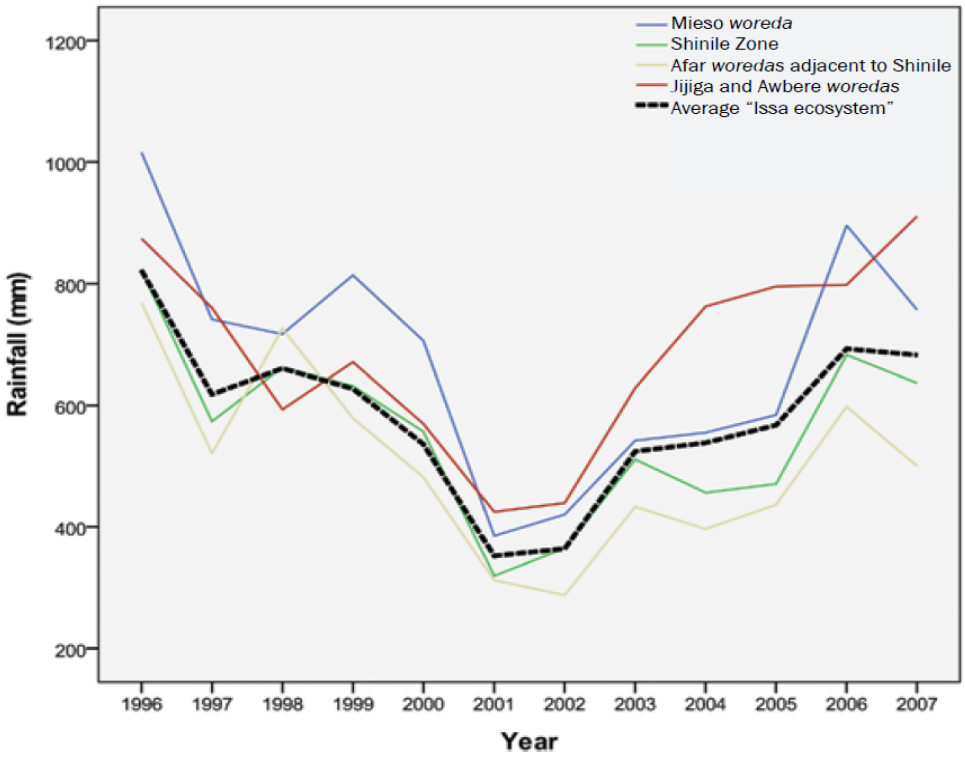
| Order of relevance | Period of analysis | Study area | Precipitation trend | Temperature Trend | Comments | Sources |
|---|---|---|---|---|---|---|
| 1 | 1960-1990 | Djibouti (Dikhil) | Decrease | N/A | Irregular rainfall, there is an important decrease (12%) in precipitations in Dikhil | Mohamed, 2006 |
| 2 | 1996-2009 | "Issa ecosystem" | Relatively constant | N/A | Relative decline in annual rainfall between 2001 and 2005, with an upwards trends towards pre-2001 levels in 2006 and 2009; typical rainfall variability by month and no marked changes in total rainfall over 83 years. | Catley and Iyasu, 2010 |
| 3 | 1966-2011 | Djibouti City | Decrease | Increase | Annual total precipitation decrease by 17.4% per decade and recent mean yearly rainfall exhibits 73% deficit compared to the 30-year (1981–2010) average; average temperature increase of +0.28◦C per decade | Ozer and Mahamoud, 2013 |
| 4 | 1961-2010 | Greater Horn of Africa (Asmara and Djibouti City) | No significant trend | Increase | Less spatial coherence trends in precipitation indices across the region; length of the maximum number of consecutive dry days is increasing; monthly minimum value of daily maximum temperature increase in most parts of the region | Omondi et al., 2014 |
| 5 | 2000-2013 | Horn of Africa | Decrease | N/A | NDWI has non-negligible degradation over the thirteen years observation period approximately from -0.05 to -0.10; portion of soil over vegetation has been increased because of dry conditions | Choi et al., 2013 |
| 6 | 1948-2009 | Greater Horn of Africa | Decrease | N/A | Significant decline in June-September precipitation during the 1970s and 1980s; this region has experienced a declining trend in summertime monsoonal precipitation for approximately the past 60 years | Williams et al., 2012 |
| 7 | 1978-2009 | Saudi Arabia | Decrease | Increase | Observed annual rainfall showed a significant decreasing trend (47.8 mm per decade) in the last half of the analysis period; maximum, mean and minimum temperatures have increased significantly at a rate of 0.71, 0.60, and 0.48 °C per decade, respectively | Almazroui et al., 2012 |
| 8 | 1970s-2011 | Arab Region | No significant trend | Increase | Drying trends, although, these are of low significance; Increased frequencies of warm days and warm nights, higher extreme temperature values, fewer cold days and cold nights and shorter cold spell durations | Donat et al., 2014 |
| 9 | 1971-2005 | Indo-Pacific Region | No significant trend | Increase | Trends in precipitation extremes are less spatially consistent across the region; Warm extremes, particularly at night, are increasing and cold extremes are decreasing | Caesar et al., 2011 |

*Source: Author's research, 'N/A' means that data were not available*

At the regional level, studies failed to find meaningful homogeneity in the trends of precipitation indices and even fewer significant trends at the local level compared to the significant increases found in temperature indices (Caesar et al. 2011, Mahamoud et al. 2013, Ozer et al. 2013, Donat et al. 2014, Omondi et al. 2014).

Figure 6.1 extracted from Catley and Iyasu (2010) 's paper shows annual rainfall from 1996 to 2007 in Shinile Zone, the Afar *woredas* adjacent to Shinile Zone, the Somali *woredas* of Jijiga and Awbere and the Mieso *woreda*. It shows similar trends in annual rainfall in Shinile Zone and adjacent pastoral/agropastoral *woredas* which confirms the tendency of rainfall patterns to correlate despite differences in mean quantities and distribution. The data further suggest that there was a drop in annual rainfall from 1999 to 2002 before quantities picked up again with a steady increase from 2002 to 2006. Overall, this 11-year period did not exhibit a clear downward trend in the amount of rainfall.

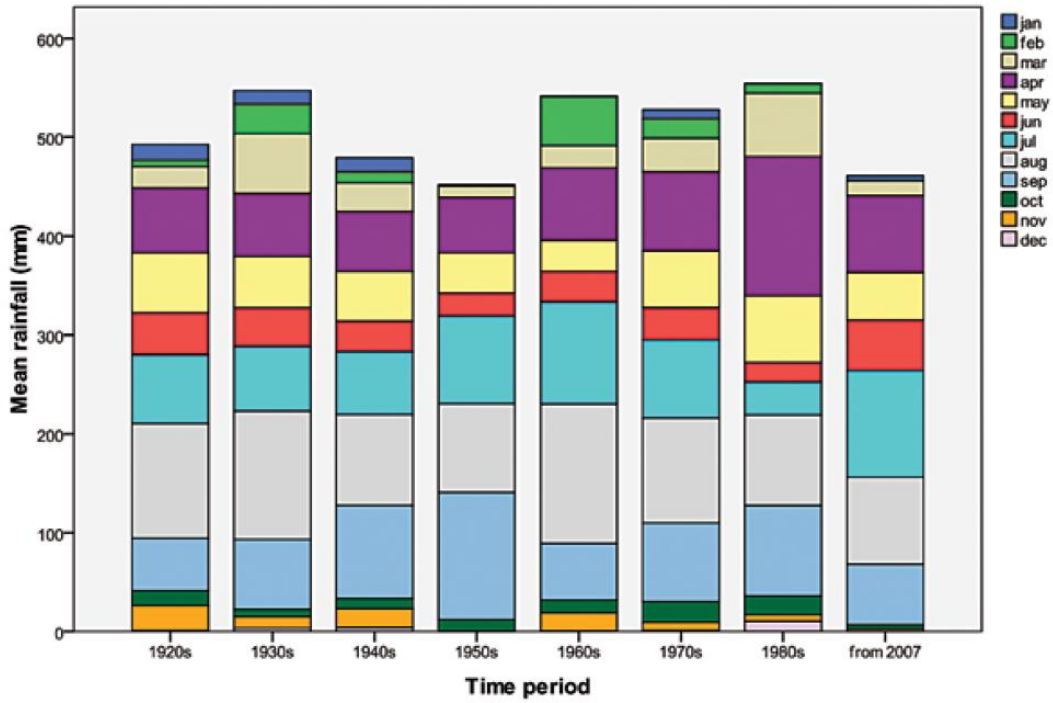
**Figure 6.1 Annual rainfall patterns in pastoral and agropastoral *woredas* adjacent to Mieso-Mulu *woreda* and Shinile Zone**




*Source: Catley and Iyasu, 2010, p.56*

Dikhil region, the North-western part of Somalia (Somaliland), Shinile zone and bordering *woredas* belong to the Issa ecosystem. Awdal State in Somaliland borders Shinile Zone and Dikhil region to the South-west. Although Borama's time-series data exhibits data gaps from the late 1980s to 2006 and despite the fact that Borama is more an agropastoral zone than a pastoral one, it is informative to incorporate data available from these zones from the 1920s to 2007. Arranged into 10-year intervals, Figure 6.2 exhibits "typical variability" by month and, more importantly, "no marked changes in total rainfall over 83 years" (Catley et al. 2010, p.56).

**Figure 6.2 Mean monthly rainfall in 10-year intervals in Borama, Somalia (1920s-2007s)**




*Source: Catley and Iyasu, 2010, p.57*

Another recent climatic study completed in Djibouti (Mahamoud et al. 2013, Ozer et al. 2013) analysed precipitation and temperature patterns from 1966 to 2011 based on data obtained from the Djiboutian Meteorological station based at Ambouli airport in Djibouti City. Their results indicated that "all precipitation indices [had] declined over the last decades" and that "extremely warm days (maximum temperature $\geq$ 45.0°C) [had] become 15 times more frequent than in the past while extremely cool nights (minimum temperature $\leq$ 8.6°C) [had] almost disappeared" (Ozer et al. 2013). Based on these results, they inferred that "this [had] impacted the well-being and, in

some cases, the survival of the inhabitants of the Republic of Djibouti [and] especially [the] rural population whose migration towards Djibouti City [had] increased in recent years" (Ozer et al. 2013).

Still, caution has to be observed in the interpretation of such results since there is immense spatial and temporal variability in rainfall throughout the region and there is very limited knowledge and understanding of past, present and future patterns of climate extremes in the GHA (Omondi et al. 2014). Contrary to the western part of the Arab region where there is a significant tendency towards wetter conditions, eastern Africa does not exhibit significantly homogenous results (Caesar et al. 2011, Ozer et al. 2013, Omondi et al. 2014). Yet, significant drying trends were found for specific indices such as the very wet day frequency and proportion (Ozer et al. 2013), total precipitation in wet days and length of maximum number of consecutive wet days (Omondi et al. 2014) and the normalized difference water index (NDWI) values (Choi et al. 2013). Similarly, climatic studies in Saudi Arabia (Almazroui et al. 2012) and in the case of certain rainy seasons such as the June-September monsoon rains in other countries (Williams et al. 2012) also indicated significant drying trends. However, few studies found a clear rise in the number of consecutive dry days in the Arabian Peninsula (Donat et al. 2014) while some even found evidence pointing to precipitation increase (Caesar et al. 2011, Omondi et al. 2014). Thus, there is no consensus as to precipitation trends in the GHA.

Aside from issues linked to adequate data availability, the existence of numerous ecosystem feedback loops between land cover and atmospheric processes represent a major challenge to clearly understand and single out specific climate drivers. The *diraac*/*sougoum* (spring) rains tend to be poorer than the *karan*/*karma* rains while the *jilal* (winter season) is known to be the driest in Dikhil region. These rainfall seasonal characteristics are 'normal' features of Dikhil region's climate. Although the manifestation of meteorological drought is strongly related to the occurrence and non-occurrence of rainfall, there are other natural as well as human factors which can also determine water availability (Wilhite et al. 1985). There are inter and intra-relationships between and within abiotic and biotic factors as well as influences from temperature, evapotranspiration, soil fertility and vegetation cover among others on climate. These connections imply the existence of reinforcing feedback loops which might play a role in pastoralists' sometimes erroneous

perception that rainfall has declined in recent times without any actual change in rainfall patterns in the data (Meze-Hausken 2004).

According to the literature, the most common variables affecting climate in the HoA (including Djibouti) are sea-surface temperatures (SST) and vegetative cover. There is a broad consensus that increases in the SST of the Indian Ocean, evaporation and precipitation are associated with increased exports of dry air both from the Southern Tropical Indian Ocean (STIO) region and the Atlantic Ocean toward the Sahel and the GHA (Dai 2011, Oba 2011, Williams et al. 2012) while the Pacific Ocean's influence on East African multidecadal climate variability was shown to be rather minimal (Tierney et al. 2013). The Indian Ocean is known to be the main moisture source for the eastern part of the HoA region, including the eastern portions of Ethiopia, Kenya and Djibouti. This convergence of dry air over the GHA reduces local convection and precipitation while contributing to a reduction of moisture transport from the Congo Basin (Williams et al. 2012, Choi et al. 2013).

Despite the broad consensus about the role of the Indian Ocean's surface temperatures in affecting East African climate, investigation into the inter-annual variability of regional measurements have yielded contradictory results about the relationship between the El Niño Southern Oscillation (ENSO) and the East African long rains with a failure to find any strong correlation between March-May rainfall and global SSTs (Camberlin et al. 2002, Caesar et al. 2011). Some believe that East African rainfall is strongly connected to ENSO and that droughts tend to happen during La Niña and/or large El Niño events (Caesar et al. 2011, Tierney et al. 2013). Yet, there is still great discussion about whether the failure of these 'long rains' in 2011 (which contributed to the 2011-2012 drought) were related to decadal variability in the Indo-Pacific region or human influence with local feedback loops that may have enhanced and prolonged the drought (Dai 2011) (Tierney et al. 2013). According to Camberlin and Philippon (2002), this debate stems from the great spatial variability of rainfall over the GHA during these rainy seasons and from the use of dissimilar and/or inadequate timescales.

Other influential factors exist and have been recognized in driving climate and rainfall fluctuations. One of those is vegetation cover. While it is itself driven by temperature, precipitation, solar

irradiance, soil conditions, and $CO_2$ concentration, a number of experiments based on general circulation models (GCMs) and Moderate Resolution Imaging Spectro-radiometer (MODIS) products have shown that vegetation influences temperature and climate in general through moisture, energy and various atmospheric exchanges (Taylor et al. 2002, Notaro et al. 2006, Pricope et al. 2013). It is deduced that although the process may start with an initial drought which reduces plant cover, dry conditions can be extended beyond lands that are already overgrazed and maintained through increased albedo and decreased evapotranspiration; in turn, associated energy decline combined with moisture transfer to the atmosphere further reduces convection necessary for rainfall to occur (Chapin III et al. 2008).

Moreover, another study showed that cloud formation over desert dusty areas as in the ASALs contain small droplets and produce little precipitation through drop coalescence. In turn, precipitation reduction from these clouds can reinforce drying up of the soil, which then raises more dust, thus contributing to a possible feedback loop which further decreases precipitation (Rosenfeld et al. 2001). In addition, physical land features such as altitude, surface roughness and landscape also exert an influence on surface-atmosphere coupling (Notaro et al. 2006). For instance, lowlands are usually known to be arid because the winds of the tropical monsoons blowing from the west and bringing seasonal rains to the Sahel and the Sudan gradually lose their moisture as they reach the lowlands of Djibouti and Somalia (Kurnik et al. 2011).

Finally, anthropogenic influences (such as land use and human-led desertification feedback processes) on the different ecosystem variables discussed above can reinforce natural climate fluctuations (Rosenfeld et al. 2001). There is much debate about the extent of human influence on observed SSTs and therefore long rains and drought occurrence through anthropogenic climate change (Lott et al. 2013). Deforestation, including other land cover changes due to overgrazing can transform land with vegetative cover into bare soil (Taylor et al. 2002, Chapin III et al. 2008). Although the balance between ecosystem feedbacks, ocean-climate inter-relationships and human-led ecological change is still poorly understood, Chapin III et al. (2008) suggest that preventing overexploitation of the land and its deforestation could reduce the likelihood of drought occurrence in arid zones.

### 6.2.3 Rural Djibouti's climate

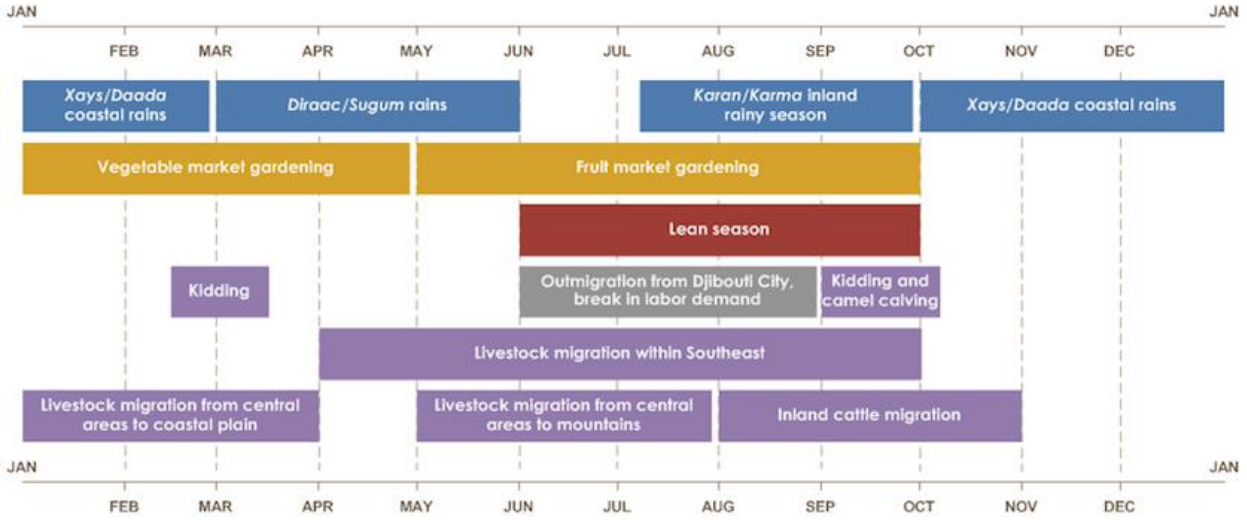
The Republic of Djibouti has a semi-arid/arid climate, except for the mountainous regions between the Southern extremity of the Gulf of Tadjoura and Obock district. These climatic conditions are responsible for strong water evaporation of about 2000 mm/year which severely affects both pasture and the soil. Only five percent of the volume received infiltrates the soil to recharge underground aquifers (Frenken 2005, p.206, Mohamed 2006). The *hagaa* (hot summer season in Somali) lasts from May to September and is defined by elevated temperatures (30 degrees Celsius (ºC) to 45ºC), strong hot sandy winds (the *Khamsin*) which blow for over 50 days and low humidity levels due to a rather tropical climate regime on the continental side (DATE 2000a, p.11). The unbearably hot conditions along the coast usually force pastoralists and their livestock to move to cooler higher ground inland where the *karan/karma*[37] rains (summer rains) are found. Some pastoralists even cross over national borders to the south and/or to the west.

The *jilal* (cool winter season in Somali) extends from October to April and is characterized by high humidity levels, mild temperatures (20ºC-30 ºC) and rainfall of a Mediterranean type on the maritime side called *xays/dadaac*. It is possible for these coastal winter rains to reach inland, including Dikhil region. The latter rains tend to fall from December to January, and even until the beginning of March in Tadjoura region (Guedda et al. 1984, p.112). Similarly, it is possible for summer rains from the interior to reach the coast, especially those coming from the high mountains of Tadjoura (Guedda et al. 1984, p.114, Audru et al. 1987, p.40). The months of May and June on the one hand, and September and October on the other are calendar transition periods between the *jilal* and *hagaa* calendar seasons. They are characterized by a combination of high temperatures and humidity levels usually accompanied by windy currents originating from the West and the North-West (DATE 2006, p.16). The mean temperatures fluctuate between 23ºC in January and 45ºC in August with a rather small amplitude between day and night temperatures.

[37] When mentioning the local names of the rainy seasons, the first name is in Somali and the second in Afar. For example, in naming the summer rainy season in Dikhil region, *karan* is the Somali name and *karma* the Afar name.

As shown in Figure 6.3, Djibouti's climate is bimodal which means that there are two main and distinct rainy seasons: the *diraac/sougoum* spring rains from March to May, and the *karan/karma* summer rains from July to early/mid-October (Guedda et al. 1984).

**Figure 6.3 Seasonal calendar of a typical year**




*Source: FEWS-Net, 2012*

The *karan/karma* rains are usually found inland while the *diraac/sougoum* rains cover most of the territory and gradually intensify as they progress inland. The month of June is usually very dry (Guedda 1989) and usually coincides with the lean season and the migration of nomads and their herds inland as shown in Figure 6.3. Similarly to the rest of the Horn of Africa (HoA), winter north-easterly trade winds do not carry any moisture aside from the mountainous areas of Somalia and Tadjoura region where late autumn rains can produce a yearly total rainfall amount of up to 500 mm.

On the eastern coast, a 'strong upwelling' combined with winds blowing parallel to the coast result in annual rainfall as low as 50 mm (Kurnik et al. 2011). Autumn and spring are key delimiting periods for rainfall seasons. The *deyr/kudo* autumn rains tend to fall from mid-October to December over the coastal region and therefore those areas are sought after by inland herders during that period. It is also possible for those rains to reach inland which help extend the inland *karan/karma* rains. Usually though, the *deyr/kudo* rains tend to fall inland only once every two or three years at most. The worst rainfall seasonal combination for pastoralists is a failure of the

*karan/karma* inland summer rains combined with an early termination of the *diraac/sougoum* spring rains. Usually, the *karan/karma* rains fail every four or five years with varying quantities received. As a result of this unreliable rainfall regime, apart from very few permanent water sources in the northern mountainous regions, there are no long-lasting water surface sources in the country. Temporary fast-flowing water currents called *oueds* are created by excessive runoff in times of intense rainfall during a short period of time (Guedda 1989, p.4-5).

Precipitation events in rural Djibouti are unpredictable and scarce in terms of their intensity, frequency and duration, reaching between 130 millimetres (mm) and 250 mm yearly in the country (DATE 2000a, p.11, Jalludin et al. 2004). Dikhil region has been estimated to receive a yearly average of 163 millimetres (mm) of rain spread over 23 days[38] (Guedda 1989, p.2). Most of the rainfall in Dikhil region (and generally inland) tends to concentrate during the *hagaa* with three quarter of total rainfall falling in July, August and September on the western and south-western part of the territory added to the *diraac/sougoum* rains received during the March-May period (Mohamed 2006, CEWARN 2007). This is also the case for both the Greater Horn of Africa (GHA) and the Sahel which are known to receive the bulk of their precipitations during the June-September summer season (Williams et al. 2012).

Moreover, according to Guedda and Godet (1984, p.114), the quantity of rainfall received across the land is unevenly distributed, both spatially and temporally. This is also confirmed by Meze-Hausken (2004)'s study in arid parts of Ethiopia, which included an assessment of variability across space. She looked at rainfall variations and anomalies in Gonder, Mekelle, Bahar Dar and Combolcha and contrasted these results with pastoralists' perceived climate change. She found high interstation rainfall variability with fluctuations in the spring (*Belg*) rains being the highest (between 31% and 55%) while the summer rains (*Kiremt*) exhibited lesser variability (between 19% and 31%) (Meze-Hausken 2004).

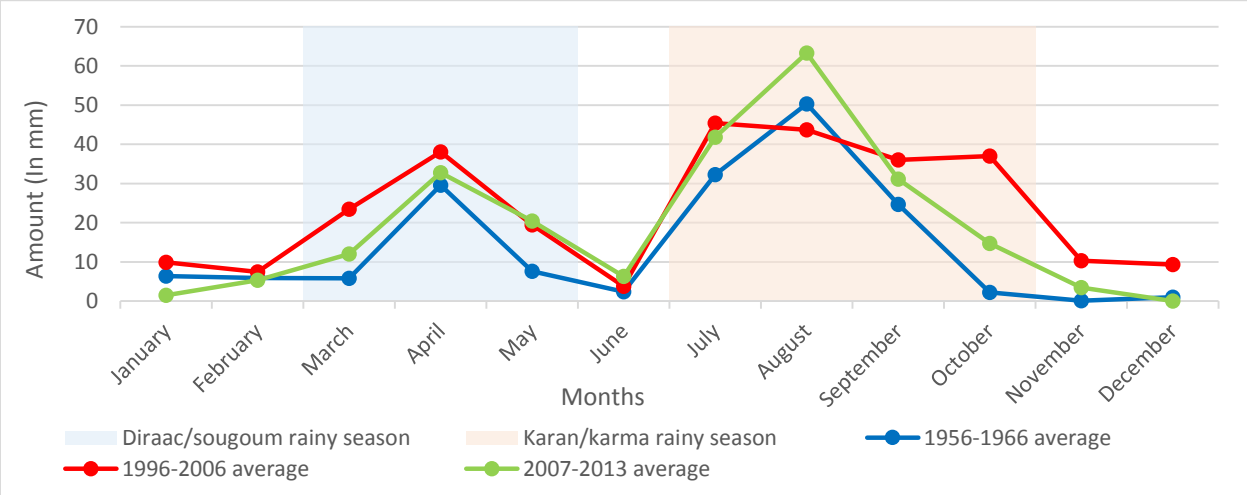
[38] Averages such as these are of only very limited use in understanding the nature of rainfall hazards in this area. These numbers will be contrasted with my own data analysis later in the chapter.

## 6.3 Analyzing rainfall data for Dikhil region

### 6.3.1 Dikhil's climate and its temporal and spatial variability

This sub-section uses satellite-imagery rainfall data and qualitative data from study sites to make sense of Dikhil region's climate, including temporal and spatial variability of rainfall. Figure 6.4 shows mean monthly rainfall averages for the 1956-1966, 1996-2006 and 2007-2013 periods, spanning 11, 11 and seven years in duration, respectively. The monthly comparison between these rainfall means indicates that both the *diraac/sougoum* and *karan/karma* rains were still occurring from 2007 to 2013 with similar yearly rainfall distributions despite differences in total rainfall amount.

**Figure 6.4 Mean monthly rainfall in Dikhil region during 1956-1966, 1996-2006 and 2007-2013 periods**




*Source: The raw data for the 1996-2013 period were extracted from the GIEWS database, compiled and analysed by the author and the 1956-1966 data emanate from the Meteorological station in Djibouti city*

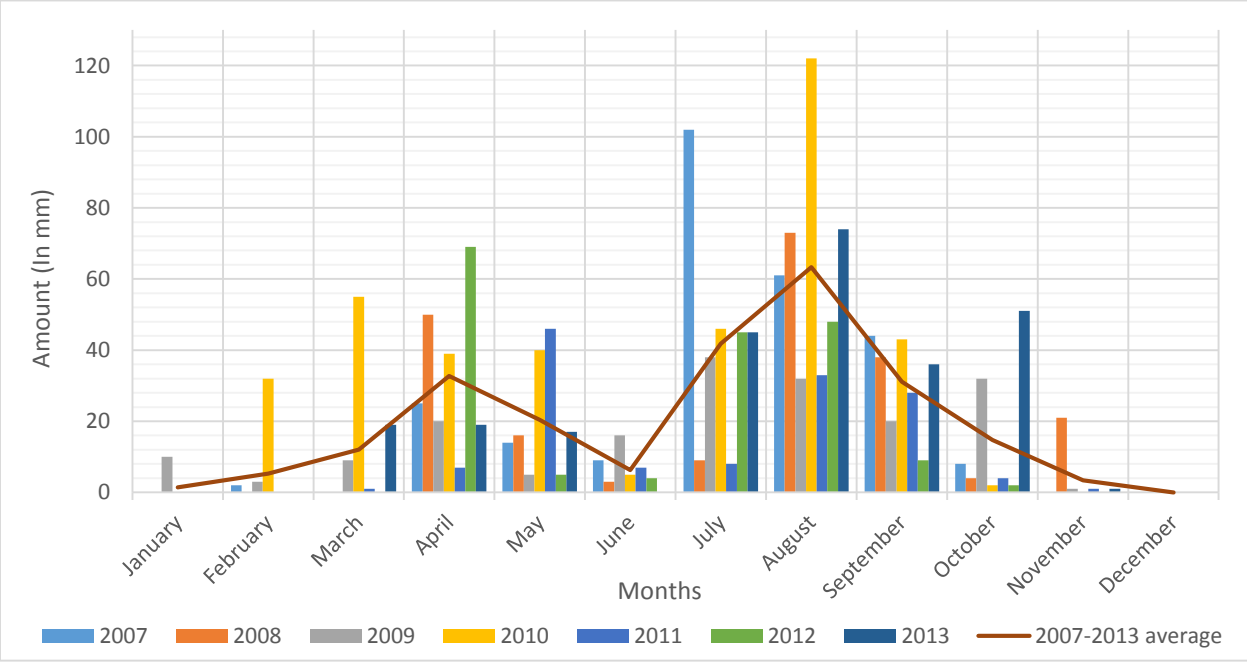
Figure 6.4 shows that the *diraac/sougoum* rains are second in importance after the *karan/karma* which represent between 20 and 60% of total yearly rainfall. Further, Figure 6.4 shows that the 2007-2013 average was higher than the 1956-1966 average for both the *diraac/sougoum* and *karan/karma* rainy seasons. The mean rainfall was also higher than the 1996-2006 average for the *karan/karma* rainy season but for the *diraac/sougoum* rainy season, it rained more on average over the 1996-2006 period than over both the 1956-1966 and 2007-2013 periods. These observations

suggest that precipitations levels were higher in the last seven year-period than those registered 30 years ago. This suggestion will be further assessed later in the chapter.

- *Comparing monthly rainfall amounts between 2007 and 2013*

To compare monthly rainfall amounts from 2007 to 2013, a graph was created representing the variation in monthly precipitation levels. Figure 6.5 shows that most of the rainfall in Dikhil region (and generally inland) tends to concentrate during the *hagaa* with three quarter of total rainfall falling in July, August and September on the western and south-western part of the territory added to the *diraac/sougoum* rains received during the March-May period. This confirms the general distribution of yearly rainfall reported by Mohamed (2006) and CEWARN (2007) in sub-section 6.2.3. In addition, as reported by Guedda and Godet (1984, p.114), Figure 6.5 shows that the quantity of rainfall received across the land was unevenly distributed, both spatially and temporally with marked variability in year to year total monthly rainfall between 2007 and 2013.

**Figure 6.5 Total monthly precipitations in Dikhil region (2007-2013)**




*Source: The raw data were extracted from the GIEWS database, compiled and analysed by the author*

For instance, monthly quantities of 102 mm and 0 mm were registered for July 2007 and November 2007, respectively, while rainfall amounts reached 9 mm and 21 mm in July 2008 and November 2008, respectively. As a result of this configuration of rainfall seasons in Dikhil region, I found from my interviews and observations that there were marked patterns in people's production patterns. Goat and camel production levels were the highest during the *diraac/sougoum* and *karan/karma* rains with many of these livestock found on the market in Dikhil City and along the Djibouti-Dikhil portion of the main road to north-eastern Ethiopia. In addition, poor households tended to sell important quantities of charcoal during the *jilal* dry season whereas firewood bundles tended to be sold from March to the end of September all throughout the summer. In contrast, livestock was sold year round at varying quantities depending on yearly rainfall fluctuations.

- *Assessing correlation in rainfall patterns between regions*

To assess the unpredictable nature of rainfall patterns, a normality test was first performed on rainfall measurement variables from 2007 to 2013. It was found that decadal and monthly amount of rainfall from 2007 to 2013 were approximately non-normally[39] distributed which means that non-parametric tests had to be used for statistical analysis. Secondly, a non-parametric Spearman's correlation test was performed to test for similar rainfall patterns from 2007 to 2013 between Ali-Sabieh region, Dikhil region, Djibouti city, Obock region and Tadjoura region measurements. As shown in Appendices 6 and 7, there was a significant correlation in rainfall patterns between all regions individually from 2007 to 2013 at the decadal (above 0.7 at the 0.01 level) and monthly scale (above 0.8 at the 0.01 level). This supports the claim that there was a common influence of both oceanic and atmospheric variables on the local climate of all five regions. However, this does not necessarily imply that there was equality between variances (equal distribution of rainfall quantities around the mean), means or medians.

[39] The satisfaction or non-satisfaction of the normality assumption determines the use of parametric or non-parametric tests, respectively, for statistical data analysis. A Shapiro-Wilk's test ($p<0.05$) and a visual inspection of their histograms, normal Q-Q plots and box plots showed that the decadal and monthly amount of rainfall from 2007 to 2013 were approximately non-normally distributed which means that non-parametric tests needed to be used for statistical analysis.

- *Assessing similarities in the distribution of rainfall between regions*

A non-parametric Levene's test was performed on decadal and monthly rainfall data to assess the spatial variability of rainfall. It was found that there is a significant difference ($p<0.05$) between variances both at the decadal ($p=0.0002$) and monthly ($p=0.0025$) scale which means that the null hypothesis of equality of variances is rejected. This indicates that there was significant spatial variability between the rainfall distributions of the five regions.

The exercise was also performed at the station level for the 1956-1966[40] period. The data corresponded to mean historical rainfall data for 12 stations in Obock region (Obock city station), Tadjourah region (Randa, Tadjoura city, Dorra and Balho stations), Arta region (Arta city and Oueha stations), Djibouti city (Djibouti Airport and Djibouti 'Serpent' stations) and Dikhil region (Dikhil city, As-Eyla and Yoboki stations). A parametric Levene's test was applied on normal data values (Randa, Tadjoura city, Obock city, Oueha, Djibouti Airport and Djibouti 'Serpent' stations) indicating a non-significant (0.08) homogeneity of variances, which means that the null hypothesis of equality of variances is rejected. In other words, there were significant differences in the distribution of rainfall between the 12 weather stations. My statistical analysis found that there was more variability across stations for the *karan/karma* summer rains (55.5% to 79.5%) than for the *diraac/sougoum* spring rains (48.5% to 62.4%), which is in contrast with Meze-Hausken (2004)'s results.

Given my own findings that there is statistically significant spatial variability in rainfall in rural Djibouti, it follows that climatic data on temperature, evaporation, humidity and rainfall originating from measurements made in Djibouti city should only be relevant to the capital. To further prove this, a non-parametric Levene's test assessing the homogeneity of variances was applied on both decadal and monthly rainfall data for Dikhil city and Djibouti city. It was found that there is a significant difference ($p<0.05$) between variances both at the decadal ($p=0.0011$) and monthly scale ($p=0.0034$) which means that the null hypothesis of equality of variances is

[40] The data used to assess rainfall variability across all 12 stations corresponded to averaged monthly measurements over the 1956-1966 period. It is hypothesized that such data may strongly hide more subtle year to year monthly variations.

rejected once again. This indicates that there was significant spatial variability between the rainfall distributions of Dikhil and the area of Djibouti City and therefore reinforces the claim that there is significant spatial variability in rainfall throughout the territory.

- *Assessing temporal variability of rainfall in Dikhil region*

Concerning temporal variability of rainfall, a year to year Spearman's correlation test was applied on decadal and monthly rainfall from 2007 to 2013. Results shown in Appendices 8 and 9 indicate that there is a fair year to year correlation at both the 0.05 and 0.01 levels in the behaviour of rainfall. In addition, a non-parametric Levene's test was performed to assess the year to year homogeneity of rainfall variances both at the decadal and monthly level for Dikhil region from 2007 to 2013. It was found that there is no significant difference ($p>0.05$) between variances both at the decadal ($p=0.517$) and monthly scale ($p=0.168$) which means that the null hypothesis of equality of variances is kept. Since there is a significant probability of equality of variances, a Kruskal-Wallis test was performed to assess the null hypothesis that mean ranks of the year to year rainfall measurement samples are the same. Appendices 10 and 11 show that there is no significant difference in the mean ranks both at the decadal and monthly scale.

To further evaluate monthly variation in rainfall across time, a monthly coefficient of variation from 2007 to 2013 was calculated to assess the degree of monthly variability of rainfall in the last seven years. Table 6.2 indicates that rainfall variability is higher in March, April and May (*diraac/sougoum* rains) with variability of 163.3%, 65.1% and 79.6% respectively, than in July, August and September (*karan/karma rains*) with a variability of 74.9%, 49.1% and 41.5%, respectively.

Similarly to other studies done in other ASALs of Africa (Schwartz 2005), my analysis found that with increasing aridity (or decreasing mean annual precipitation), seasonality became more pronounced as periods without effective rainfall grew longer. As a result, the seasonal and annual variation of rainfall increased abruptly and the growing period for plant development therefore diminished.

As shown in Table 6.2, in reality, for January and December, there is very little variation because in most years there is simply no rain at all. Concerning the rainy seasons, there is little variation in rainfall during the *jilal* (November to February). The great coefficient of variation for the *jilal* and the month of June do not mean that there is great fluctuation since most years exhibit a similar low amount of rainfall. Rather, it is noticed that there is great monthly variations between 2007 and 2013 for the *diraac/sougoum* (March to May) and *karan/karma* rains (July to October) shown in bold which, as indicated in section 6.3.3, are the most crucial yearly periods for the survival of pastoral livelihoods.

**Table 6.2 Assessment of monthly variation of rainfall in Dikhil region from 2007 to 2013**

| Months | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | % CV |
|---|---|---|---|---|---|---|---|---|
| **January** | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 264.6 |
| **February** | 2 | 0 | 3 | 32 | 0 | 0 | 0 | 224.0 |
| **March** | 0 | 0 | 9 | 55 | 1 | 2 | 19 | **163.3** |
| **April** | 25 | 50 | 20 | 39 | 7 | 69 | 19 | **65.1** |
| **May** | 14 | 16 | 5 | 40 | 46 | 5 | 17 | **79.6** |
| **June** | 9 | 3 | 16 | 5 | 7 | 4 | 0 | 82.0 |
| **July** | 102 | 9 | 38 | 46 | 8 | 45 | 45 | **74.9** |
| **August** | 61 | 73 | 32 | 122 | 33 | 48 | 74 | **49.1** |
| **September** | 44 | 38 | 20 | 43 | 28 | 9 | 36 | **41.5** |
| **October** | 8 | 4 | 32 | 2 | 4 | 2 | 51 | **130.5** |
| **November** | 0 | 21 | 1 | 0 | 1 | 0 | 1 | 226.5 |
| **December** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A |

*Source: The raw data were extracted from the GIEWS database, compiled and analysed by the author, '%CV' stands for 'percentage of variation' (coefficient of variation) and N/A stands for 'not applicable'.*

As shown in earlier works (Agnew et al. 1999), the results discussed in this section are in accordance with the way in which there is temporal variability in rainfall whereas the seasonal succession of wet and dry periods during the years is fairly fixed. This explains why herders are able to evaluate the state of ecosystem services such as forage and water availability in relation to their needs from one year to the next. An important corollary is that the possibility of predicting 'normal' behaviour of yearly rainfall based on sufficiently long time-series data could be used in Djibouti as an early warning tool in case of abnormal rainfall behaviour preceding drought events.

As mentioned in Chapter Two, caution must be observed regarding the temporal scale at which climatic data is analysed. The use of annual, monthly[41] (and maybe decadal) data may not allow for the detection of possible changes in daily rainfall because important information linked to the behaviour of extremes may be hidden while the existence of various atmospheric dynamics often associated with impacts on livelihoods could be missed (Camberlin et al. 2002, Zhang et al. 2011). According to Agnew and Chappell (1999), the study of both normal and optimal rainfall needs to be considered not only in terms of its magnitude, but also with respect to seasonal fluctuations and delays in the start of the rainy season. In addition, the duration, amount, intensity and distribution of rainfall events both temporally and spatially must also be taken into account (Agnew et al. 1999).

### 6.3.2 Uncovering pastoralists' perceptions of rainfall patterns

This sub-section discusses pastoralists' interpretation of drought occurrence and perceptions about recent rainfall behaviour. Even in the case of there being a recognized and nationally accepted definition of drought, the appreciation of the concept differs markedly between those who experience the event and those external actors in charge of helping those affected. Prolonged periods of aridity and recurrent drought is considered 'normal' by rural pastoralists of Djibouti as it is exemplified in the following quote:

> "Droughts are natural although there can be different types of droughts. There were short droughts where we could wait a certain time until it rained and others that force us to move from place to place. There were many droughts in the countryside but this one is the worst. The one that hit us 10 years ago was milder but still forced us to search for food and allowed our cattle to rebound. The droughts that we experienced in between were different. However, the current one has killed all my cattle (camel, cows, goats, and donkeys) despite having spared my family." *(SI3, 2012)*

This passage clearly illustrates the recurrent nature of droughts in Dikhil region which formed an integral part of pastoral life all throughout their lives. Fieldwork results indicate that 48 out of 53 respondents (90%) reported living with periodic drought their whole life, with differing numbers

[41] Still, monthly means provide simple metrics which can be relevant in tracking slow climate variations (Zhang et al., 2011).

of droughts (from 10 to 100 droughts) over various generations. The most recent rains were reported falling about a year preceding the interview date in early 2012. Respondents also indicated that there were different types of drought. These varied in intensity and duration, differentially affecting both the people and their cattle with impacts ranging from temporary hunger, sickness to even death of both people and animals. Pastoralists classified the different *abaaraha* (drought in Somali) according to specific abiotic characteristics and biological symptoms that accompanied the drought. It included the *Barariya* (Swelling drought), the *Orod wayne* (Run-away drought), the *Afqaloociya* (Hollow-mouth), the *Barariso* (Edema drought), the *Siigo dheer* (Long wind drought), the *Arbaca* (Wednesday drought), the *Sabbti* (Saturday drought), the *Axad* (Sunday drought) and the *Siigo cas* (Red wind drought). Nevertheless, regardless of the drought type, it was often remarked that its persistence often led to human after-effects such as under-nutrition, hunger, extreme thirst, disease and death, especially amongst young children, the elderly and pregnant women.

Since drought impacts differed according to families' possessions, capitals and array of opportunities, there also tended to be differences in defining drought in both time and space. Despite the fact that most respondents originated from the region (some reported coming from the other side of the Ethiopian border), there were perception differences in drought length time and intensity. For instance, timing of the last drought differed according to the moment when the irreversible switch from nomadic to settling life happened. With the use of NVivo, a correlation matrix table was generated to visualize the relationship between the length of stay of respondents in Sankal village and their reported length of the last drought. Table 6.3 shows that there was a correlation between the length of the last drought (deemed the worst one among respondents) and the length of stay in Sankal village with a margin error of a year. Since the 'length of stay' and 'duration of last drought' data was normal[42], a two-tailed Pearson's correlation test was run to assess the significance of the relationship. It revealed that there was a significant correlation between the two variables at the 0.01 level (Appendix 12). This explains the lack of consensus as to the exact start of the last drought since it varied according to households' experience with it.

[42] A Shapiro-Wilk's test ($p<0.05$) and a visual inspection of their histograms, normal Q-Q plots and box plots showed that 'length of stay' and 'duration of last drought' were approximately normally distributed, with a skewness of 0.744 (SE = 0.393) and a kurtosis of -0.090 (SE = 0.768) for 'length of stay' and a skewness of 0.281 (SE = 0.393) and a kurtosis of -0.287 (SE = 0.768) for 'duration of last drought'.

Those that were only a little or moderately affected and who still had a few animals left (length of stay ≤ 5 years) tended to diminish the length of the last drought while those who had completely fallen out of nomadic life (length of stay ≥ 6 years) stretched the length of the last drought up to seven years. Another point is that there was a relative consensus among Sankal pastoralists that the last drought (which seems to have started after 2007) was the worst drought they ever experienced. Added to the qualitative information collected through semi-structured interviews, results seem to indicate that pastoralists' perceptions of drought occurrence is strongly related to the degree of impact which in this case corresponds to loss of livestock, forcing rural households to sedentarize.

**Table 6.3 Correlation matrix between length of stay in Sankal and perceptions of length of last drought (%, number in brackets)**

| Length of stay vs length of last drought | Length of stay (in years) = 4 | Length of stay (in years) = 5 | Length of stay (in years) = 6 | Length of stay (in years) = 7 | Length of stay (in years) = 8 |
|---|---|---|---|---|---|
| **Length of last drought (in years) = 3** | 0% | 4.38% (1) | **57.98% (3)** | 0% | 0% |
| **Length of last drought (in years) = 4** | 27.36% (2) | 0% | 0% | 24.49% (1) | 0% |
| **Length of last drought (in years) = 5** | **72.64% (3)** | **82.26% (16)** | 0% | 0% | 0% |
| **Length of last drought (in years) = 6** | 0% | 0% | 12.29% (1) | 0% | 0% |
| **Length of last drought (in years) = 7** | 0% | 5.97% (1) | 29.72% (1) | **75.51% (5)** | 0% |
| **Length of last drought (in years) = 8** | 0% | 7.39% (1) | 0% | 0% | **100% (1)** |

*Source: Author's research*

Before contrasting rural households' claims against satellite imagery data about recent rainfall trends, the land area used for the practice of pastoralism must first be defined. Since the practice of pastoralism strongly relies on mobility as an adaptive mechanism to environmental fluctuations and given the fact that herders' movements closely follow rainfall, analysis of the relationship between rainfall patterns and its impacts on pastoral livelihoods needs to incorporate the wider ecosystem within which both Afar and Somali-Ise herders regularly migrate. According to a study

by Catley and Iyasu (2010) conducted in Ethiopia in March and April 2010, the "Issa ecosystem" to which the pastoralists of all study sites belong can be described as follows:

> "[The Issa] system includes parts of Afar Region to the west and north, Jijiga Zone to the southeast, Somalia to the east, and Djibouti to the north. Within Ethiopia, the neighbouring Afar *woredas*[43] to the west and north of Shinile Zone are Amibara, Gewane, Mille, Dubti, and Afambo. The neighbouring Somali *woredas* to the southeast are Awbare and Jijiga (in Jijiga Zone)." (Catley et al. 2010, p.56)

Thus, if there is good rainfall outside of Dikhil region in neighbouring areas like Jijiga Zone and Shinile Zone in Ethiopia or the North-western part of Somalia (Somaliland), these areas represent good alternative areal options if there are rainfall deficits in the south-western part of Djibouti (including Sankal, Bondora, Koutabouya study sites).

Fieldwork in Sankal was carried out in February and March 2012 during the *jilal* dry season. Results indicate that respondents evaluated the gravity or severity of droughts depending on the intensity of the impacts on their livelihood. To assess this claim, 2007-2013 precipitation data in Dikhil region was contrasted with pastoralists' testimonies and experiences with rainfall behaviour over the last eight years. As pastoralists were asked to single out the worst drought they had ever experienced, 49 out of 53 (92.5%) interviewed respondents indicated that the last drought was the worst. The main reasons cited are summarized in SI3 and SI17's citations hereafter:

> "I think [drought] hit us ten years ago but that one wasn't as harsh as this one because it left some cattle. We went to Bondora and the government helped us for six months. Later it rained and we got on with our nomadic life while taking care of what was left from before. We therefore managed to rebound. However, this drought brought us here as it didn't leave a single animal alive. As a result, we tried to get some help from the government." *(SI3, 2012)*

> "We used to have droughts. I know that this drought is very bad. The latter is the worst because it took away all the remaining cattle. Before, the droughts would still leave some animals alive so as to give some time for the livestock to rebound. However nowadays, there is hardly any rain and we lost all our animals. We had a lot of droughts. All our kids are here. We suffer from hunger and thirst. We don't have enough food except a little bit of flour and oil. My mother is sick and the ambulance took her. The military called

[43] A *woreda* is an administrative unit in Ethiopia, equivalent to a district or region in the Republic of Djibouti.

> the ambulance for us. They took her a couple of days before. I haven't heard anything about her since. We don't have any food so of course, we don't have any telephone. "*(SI17, 2012)*

According to respondents, the current drought which started between five and seven years ago, is the worst. They indicated that the three worst consequences often reported were sickness, lack of water and lack of food which could end up with the death of the individual(s) affected. Respondents indicated that since it did not rain as much as before, the landscape had considerably darkened and pasture lands with sufficient forage were harder to find. However, more than just quantity of rainfall, rural households emphasized that the problem was rather linked to rains failing to 'come back', meaning that rainy seasons were failing a lot more often. However, it was unclear whether it was in terms of the quantity of precipitations received or the seasonal timing:

> "The drought is not ceasing. Before, when rains would come, we could still find milk and survive for five years without rain. This drought is not stopping. Actually, I have been here for seven years now. We get rain for two or four days and that's it. There was no drought like this before this one. The Arab agency would give one sheep to eat for every ten houses for the Eid Al Adha." *(SI9, 2012)*

When asked to further develop their interpretation and understanding of recent rainfall patterns, herders indicated that since 'their fathers' time' (20–30 years ago), there has been a progressive failure of all three rainy seasons (*karan/karma*, *diraac/sougoum* and the coastal *xays/dadaac* rains). They stated that the last seven to eight years were marked by absolute lack of rain:

> "We have had droughts for the past 20 years. There are no *karan/karma*, *diraac/sougoum* nor *xays/dadaac* rains. This current drought keeps on going. It is worse than before. This is the drought that brought us here and is therefore the worst of all. We used to live in Dhadhiin. Everything is in the hands of God (Illaahay bay amuurtu kutaala – anything there is, is by God)." *(SI4, 2012)*

The last important point is that the respondents interviewed in the study sites did not move much from their settlement area in the last seven to eight years. It is therefore postulated that the sedentarization process might have affected the accuracy of their perceptions about rainfall patterns in the overall Issa ecosystem. In other words, although it may be true that it has barely rained in the last decade, it does not necessarily mean that it has not rained in other places within the Issa ecosystem.

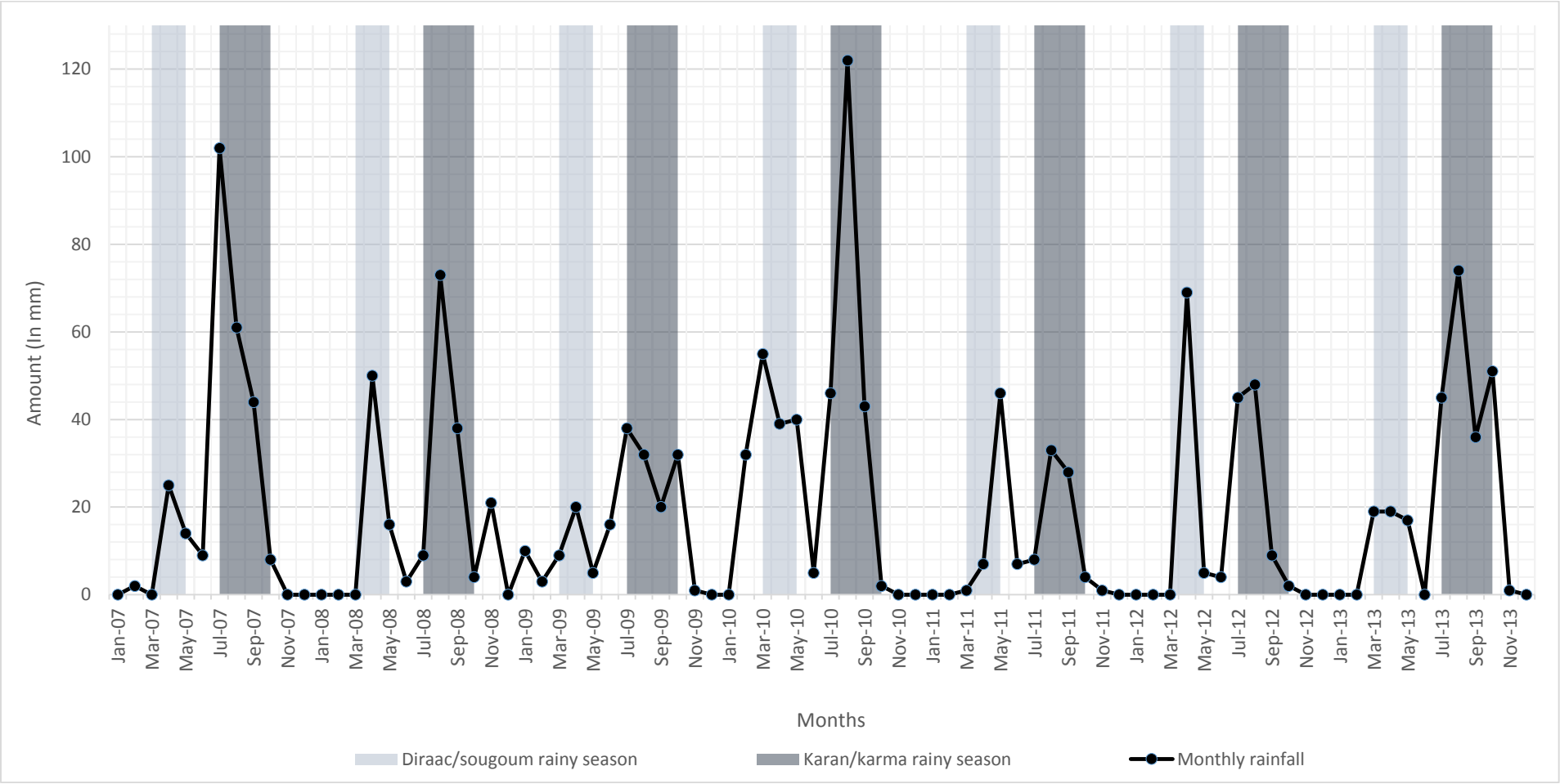
### 6.3.3 Rainfall behaviour and drought occurrence in Dikhil region

This sub-section presents and discusses my analysis of rainfall data and qualitative data about the climate trends and more precisely, the behaviour of rainfall in Dikhil region and the overall Issa ecosystem. To assess the presence and/or absence of rainy seasons, monthly variations in rainfall in Dikhil region from 2007 to 2013 were graphed. Contrary to herders' remarks from sub-section 6.3.2, Figure 6.6 shows no evidence of an abnormal failure in the occurrence of rainy seasons between 2007 and 2013. Although there are clear fluctuations during the year, a one-year cycle is portrayed with the regular succession of *diraac/sougoum* and *karan/karma* rains from March to May and July to mid-October, respectively. A closer examination of rainfall patterns for each rainy season in Figure 6.6 (and Table 6.5 in bold thereafter) shows that in 2010, there was very high rainfall during the *diraac/sougoum* (134 mm) and *karan/karma* (213 mm) rainy seasons. The 2010 rainy seasons have been the greatest in the last decade with a sharp increase in total quantities for the *diraac/sougoum*, *karan/karma* and *xays/dadaac* rainy seasons by 189.2%, 38.6% and 159%, respectively, compared to the previous three-year average.

To triangulate the information and investigate the impacts from the 2010 heavy rains on rural livelihoods, the DesInventar database was consulted. This hazard management tool was recently set up at the Research and Studies Centre of Djibouti (CERD) as part of a series of initiatives undertaken as per the pledges signed and ratified by the Republic of Djibouti under the Hyogo Framework for action. Heavy rains provoked surface run-off accumulation and created *oueds* resulting in intense flooding reported in several villages in Dikhil region, including Koutabouya and Hanlé 2 study sites in Table 6.4. In addition to a flood-impact assessment by Vinet et al. (2012) in As-Eyla prefecture, the 2010 flash-floods were also reported by rural households from three of the five study sites namely Bondora, Hanlé 2 and Koutabouya[44].

[44] In Koutabouya, a palm-date agricultural field had been initiated two years prior to the event but the 2010 floods completely erased the field. Agriculture had not resumed since.

**Figure 6.6 Monthly rainfall and periodicity of rainy seasons in Dikhil Region (January 2007-December 2013)**




*Source: The raw data were extracted from the GIEWS database, compiled and analysed by the author*

**Table 6.4 Temporal and spatial impact of floods in several villages in Dikhil region**

| Prefecture/Sub-Prefecture | Village | Date (yyyy/mm/dd) |
|---|---|---|
| As-Eyla | **Koutabouya** | 2010/11/15 |
| Yoboki | **Hanlé** | 2010/8/25 |
| As-Eyla | Yalahlou | 2010/8/25 |
| Dikhil | Abaitou | 2010/8/25 |
| As-Eyla | Afahtou | 2010/8/25 |
| Dikhil | Chekeiti | 2010/8/25 |
| Yoboki | Gagadé | 2010/8/25 |
| Yoboki | Gagadé | 2010/12/15 |
| Dikhil | Gami | 2010/8/25 |
| Yoboki | Gourabous | 2010/8/25 |
| Dikhil | Harrou | 2010/8/25 |
| As-Eyla | Holloyta | 2010/8/25 |
| Dikhil | Kontali | 2010/8/25 |

*Source: Table extracted by the author from the DesInventar database*

As a result of these floods, many household livelihoods were severely affected, including significant livestock loss and numerous gardens/agricultural plots established along the various *oueds* in the Aoussa and Gobaad Sultanates have been destroyed. Subsequent to these flash-floods, the media reported "the worst drought in 60 years" affecting the entire East African region "between July 2011 and mid-2012" (Brown 2011). The drought caused a severe food crisis across Somalia, Djibouti, Ethiopia and Kenya (Ozer et al. 2013).

**Table 6.5 Total seasonal precipitations from 2007 to 2013 in Dikhil region**

| Rainy seasons | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | Mean | STD | %CV |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Diraac/sougoum*** | 39 | 66 | 34 | **134** | 54 | 74 | 55 | 65.1 | 33.4 | 51.3 |
| ***Karan/karma*** | 215 | 124 | 122 | **213** | 73 | 104 | 206 | 151 | 58.9 | 39.0 |
| ***Xays/dadaac*** | 2 | 21 | 14 | **32** | 1 | 0 | 1 | 10.1 | 12.6 | 123.9 |

*Source: The raw data were extracted from the GIEWS database, compiled and analysed by the author*

This was confirmed by my own data analysis. Figure 6.7 and Table 6.6 show that the 2011 *diraac/sougoum* rains had started in May 2011 instead of March 2011, which was about two months later than expected. In addition, Table 6.5 shows that there was a considerable failure (52% less rain than the seven-year average) in the 2011 *karan/karma* rains. Following this failure, it did

not rain until the return of the following *diraac/sougoum* rains of 2012 in April, as normally expected.

**Table 6.6 Total monthly rainfall estimates (RFE) over three 11-month periods in Dikhil region**

| | 2010-2011 | | 2011-2012 'drought' | | 2012-2013 | |
|---|---|---|---|---|---|---|
| 11-month span | **Months** | **RFE (in mm)** | **Months** | **RFE (in mm)** | **Months** | **RFE (in mm)** |
| | **Sep-10** | 43 | **Jul-11** | 8 | **May-12** | 5 |
| | **Oct-10** | 2 | **Aug-11** | 33 | **Jun-12** | 4 |
| | **Nov-10** | 0 | **Sep-11** | 28 | **Jul-12** | 45 |
| | **Dec-10** | 0 | **Oct-11** | 4 | **Aug-12** | 48 |
| | **Jan-11** | 0 | **Nov-11** | 1 | **Sep-12** | 9 |
| | **Feb-11** | 0 | **Dec-11** | 0 | **Oct-12** | 2 |
| | **Mar-11** | 1 | **Jan-12** | 0 | **Nov-12** | 0 |
| | **Apr-11** | 7 | **Feb-12** | 0 | **Dec-12** | 0 |
| | **May-11** | 46 | **Mar-12** | 0 | **Jan-13** | 0 |
| | **Jun-11** | 7 | **Apr-12** | 69 | **Feb-13** | 0 |
| | **Jul-11** | 8 | **May-12** | 5 | **Mar-13** | 19 |
| | **Aug-11** | 33 | **Jun-12** | 4 | **Apr-13** | 19 |
| **Total** | | 147 | | 152 | | 151 |
| **Mean** | | 12.25 | | 12.67 | | 12.58 |

*Source: The raw data were extracted from the GIEWS database, compiled and analysed by the author*

According to the drought definition proposed for Djibouti in section 6.2.1, there must be a failure or significantly low levels of rainfall during the *diraac/sougoum* and *karan/karma* rainy seasons in last five years at least. My analysis found that from October 2010 to June 2012 (21 months), a period which included the 2010-2011 dry season, the *diraac/Sougoum* and *karan/karma* rainy seasons of 2011 and the 2011-2012 *jilal* dry season, the total amount of rainfall reached 215 mm, which was considerably less than quantities registered over any same duration of 21 months since 2007[45] and most likely beyond. Since the rainfall data found did not extend up to 60 years in the past, it was not possible to verify the unprecedented nature of the drought for Dikhil region. However, considering the July 2011-July 2012 drought period given in the media, a comparison was made with two similar periods prior and after the drought event. Although the three periods compared in Table 6.6 overlap by about two months, it is striking to see that comparable rainfall

[45] Yearly data earlier than 2007 was unavailable.

amounts were found. It rained slightly less during the September 2010-August 2011 and May 2012-April 2013 periods than during the July 2011-June 2012 period without creating any buzz in the news media.

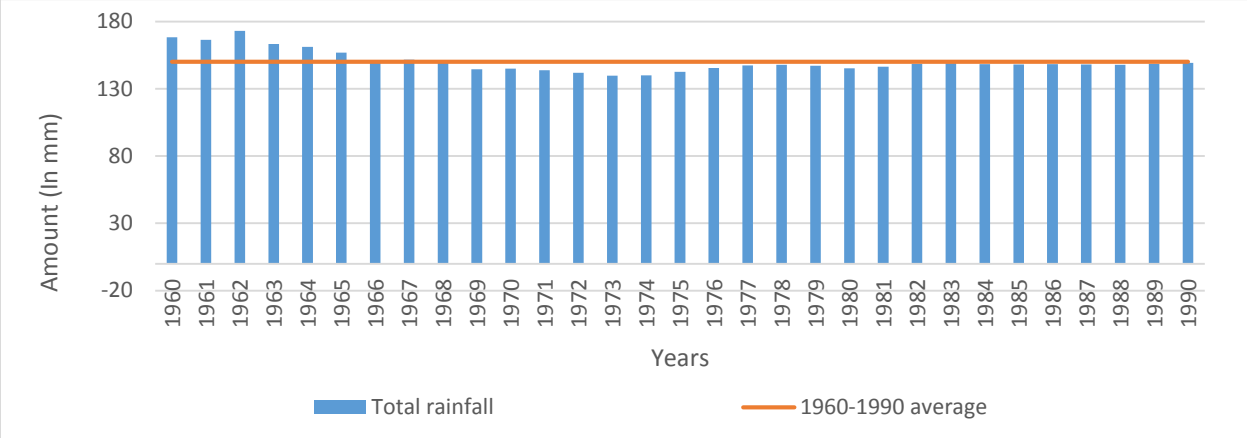
To sum-up, in light of the information presented above, it is suggested that an unfortunate sequence of climatic events participated in producing the 2011-2012 drought in Dikhil region. Firstly, rural households were struck by the 2010 flash-floods which greatly undermined their livelihoods on the short term. Secondly, subsequently to the flash-floods, the 2011-2012 drought started with the early ending of the 2010 *karan/karma* rains in September rather than normally expected in October. Thirdly, as shown in Table 6.6, the 2011 *diraac/sougoum* rainy season did not start until May with very low amounts of rainfall received both in March (one mm) and April (seven mm), representing a decrease of 20.9% compared to the previous 4-year average. Fourthly, albeit not unusual inland, the coastal *xays/dadaac* rains were absent (one mm for the entire 4-month period). Fifthly, rural households then experienced successive low amounts of rainfall during the 2011 *karan/karma* rains and the following *xays/dadaac* rains by 56.6% and 94.2%, respectively, from the previous 4-year average. All in all, contrary to the media's claims, the drought in Dikhil region actually started in September 2010 and lasted until the return of the normal *diraac/sougoum* rains in April 2012.

In addition to the analysis above, rainfall data for the last five decades were sought and analysed to extract any meaningful trends and/or evidence for the relatively recent occurrence of droughts. Yearly fluctuations in Dikhil region's rainfall from 1960 to 1990 and from 2007 to 2013 were separately analysed since they differed in nature and in terms of where they emanated from. The data for the 1960-1990 period were extracted from Mohamed (2006) whereas the 2007-2013 data were extracted from the GIEWS database. However, caution was observed in using Mohamed (2006)'s data because given rainfall's high spatial variability in Djibouti, it was not known whether the 1960-1990 data was applicable solely to Dikhil city or to Dikhil region as a whole. Therefore, to assess if data extracted from Dikhil city can globally reflect or be extrapolated to the scale of Dikhil region, a non-parametric[46] Levene's test of homogeneity of variances was applied to 1956-

[46] Earlier in the Chapter, it was shown that some stations located in Dikhil region registered non-normal rainfall data. As a result, non-parametric statistical tests were performed for this analysis.

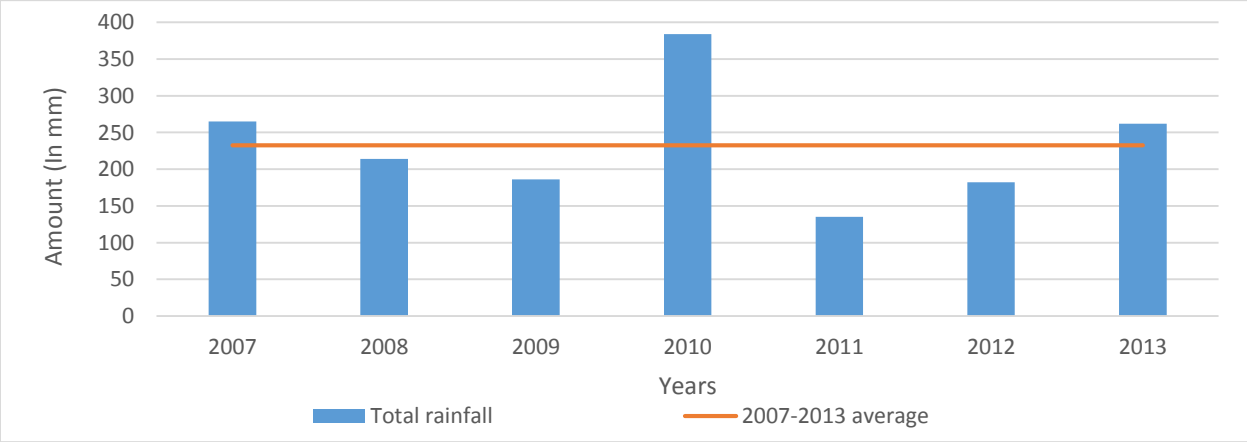
1966 rainfall data registered in Dikhil city, As-Eyla and Yoboki weather stations located in Dikhil region. It was found that there is significant homogeneity (0.851) in rainfall distribution across these stations at the 0.05 level which means that the null hypothesis of equality of variance was kept. Further, a Kruskal-Wallis test was performed to test for equality of rainfall means. Again, a positive significance of 0.6 was found at the 0.05 level which means that the null hypothesis of equality of means was also kept. Consequently, bearing in mind that the values tested are 11-year monthly averages which can mask more subtle variability, in the event that the rainfall data extracted from (Mohamed 2006) were measurements for Dikhil city, the data can still be extrapolated and used for Dikhil region as a whole.

**Figure 6.7 Yearly rainfall fluctuations in Dikhil region from 1960 to 1990**




*Source: Adapted by author from Mohamed, 2006, p.18*

**Figure 6.8 Yearly rainfall fluctuations in Dikhil region from 2007 to 2013**




*Source: The raw data were extracted from the GIEWS database, compiled and analysed by the author*

As seen in Figure 6.7, there was a slight downward trend in rainfall amounts from 1962 to 1973. Rainfall then picks up from 1973 to 1977 and approximately maintains this level until 1990. Yearly rainfall variations barely departed from the mean during the 30-year period which seriously questions the credibility of the data. In contrast, Figure 6.8 shows that total rainfall steadily decreased from 2007 to 2009, followed by an abrupt high in 2010 and a steep drop in total amounts in 2011 which coincided with the drought year that hit the HoA region. Then, in 2012 and 2013, total yearly precipitations picked up and rose. However, after examination of Figure 6.7, serious concerns were noted about Hériarivo (quoted in Mohamed 2006, p.18)'s data because the lack of clear fluctuations in rainfall behaviour does not reflect those usually found in ASALs, including the rain gauge data from the Meteorological Station in Djibouti city (Mahamoud et al. 2013, Ozer et al. 2013). In contrast, the rainfall fluctuations displayed in Figure 6.8 are more representative of those found in non-equilibrium environments. It follows that these unique rain gauge data found for Dikhil region cannot be used to formulate an opinion about the overall rainfall pattern of rainfall since 1960.

This section triangulated available rainfall data in the Issa ecosystem, including the pastoral system containing the study sites for this research. Earlier in the section, it was stated that respondents believed that climate has been shifting with decreasing precipitation levels since the time of their 'fathers'. However, rain gauge and satellite imagery data analysis from 1960 to 2013 showed that, contrary to respondents' beliefs, rainfall patterns and the occurrence of droughts and aridity periods due to normal seasonal failures in rainfall did not exhibit significant fluctuations towards abnormal drought conditions.

## 6.4 Conclusion

This chapter showed that the normal seasonal cycle inland and Dikhil region exhibit *diraac/sougoum* rains that tend to be poorer than the *karan/karma* rains while the *jilal* is normally known to be the driest. It was seen that amidst claims of decreasing precipitations in the last decades, the rainy seasons continued to occur in Dikhil region with similar yearly distributions of rainfall despite differences in rainfall density. In addition, analysis of rainfall variability between

regions and weather stations indicated that although there is indeed spatial variability both between regions and between weather stations throughout the territory, there still seemed to be a fairly constant seasonal cycle in the behaviour of rainfall across the years. Caution was observed in the use of satellite imagery data for this study. Some of the factors that can account for difficulty in monitoring and interpreting actual rainfall data in the HoA and Dikhil region are linked to complex ecosystem feedback loops triggered by land-use changes, interstation variability and lack of data.

Taking the 2010-2012 'drought' as an example, it was found that its harsh impacts on pastoral livelihoods were due to a combination of factors: destruction of most rural livelihoods by the 2010 flash-floods, early finish of the 2010 *karan/karma* rains in September instead of October, later start of the 2011 *diraac/sougoum* rains in May instead of March with lower amounts than the previous 4-year average, low amounts received during the 2011 *karan/karma* and *xays/dadaac* rains until the 'normal' return of the 2012 *diraac/sougoum* rains. Contrary to the media's claim, in light of the observations made through qualitative and quantitative data analysis of normal climate in Dikhil region, it is stated that the 2010-2012 drought was a *normal* drought. Given the disaster risk perspective and the disaster risk equation mentioned in Chapter Two, the corollary is that the 2010-2011 drought cannot be considered as a hazard in the context of Dikhil region. It thus follows that the investigation must turn toward an examination of unsafe conditions and vulnerability elements.

In addition, contrary to pastoralists' claims of there being less rains than at the time of their fathers', no overall decrease in rainfall patterns were found in the last seven years. The earlier analysis demonstrated that there is no evidence of a clear downward trend in rainfall affecting this area and that recent drought events have been shown to be *normal* according to the definition enunciated in section 6.2.1. Obviously there is a contradiction between respondents' views and the reality. However these were explained by the fact that the interviewed pastoralists had sedentarized in the last seven to eight years and therefore had not circulated in the overall Issa ecosystem. Their views were thus not accurate due to their lack of mobility.

Yet, given the inadequate picture obtained from Hériarivo (quoted in Mohamed 2006, p.18)'s data for the 1960-1990 period, it was not possible to assess the overall trend of rainfall in the last 50 years. However, an examination of rainfall patterns and rainfall seasons in the last seven years

combined with the similar trends found in neighbouring Shinile Zone and Borama in Northern Somaliland in Catley and Iyasu (Catley et al. 2010)'s study suggest that contrary to rural households' perceptions, there is no evidence of an abnormal drought in the last eight years in Dikhil region.

All in all, when the detailed analysis of available rainfall data is combined with the qualitative data about pastoralists' views, it is argued that rather than decreasing rainfall patterns as the main cause of food insecurity in the study sites, Dikhil region and the Issa ecosystem, it seems that pastoral households are experiencing greater difficulty in resisting, absorbing and recovering from *normal* droughts and dry seasons. In continuation, the following chapter investigates the sedentarization process and the progressive appearance of unsafe conditions which may have played a role in weakening rural pastoral livelihoods in the face of normal non-equilibrium fluctuations.

# 7 Sedentarization and the materialization of unsafe conditions

## 7.1 Introduction

This thesis views 'unsafe conditions' as the "specific forms in which the vulnerability of a population is expressed in time and space in conjunction with a hazard" (Wisner et al. 2004, p.55). It therefore refers to the hazardous conditions lived by the people under study, which includes the tendency to "engage in dangerous livelihoods", "having minimal food entitlements" and factors of access to essential resources. It also touches upon the cause and effect mechanisms involved between deteriorating living conditions and people's well-being (Wisner et al. 2004, p.55).

This chapter addresses the third research sub-question from Chapter One which is reiterated here:

- How did root causes and local dynamic pressures participate in producing current unsafe conditions?

As a response to the above sub-question, the chapter uncovers the drivers behind the sedentarization process and the social-environmental impacts that accompanied the livelihood change from a nomadic pastoral life to a sedentary one. It includes citations, quotes and information obtained through semi-structured interviews conducted in Sankal. Additionally, the consequences of land-use change and decreased mobility on the nature of land exploitation are discussed. Eventually, the chapter addresses the resulting pressures on both water and forage resources in the production of unsafe conditions. Hanlé 2, Koutabouya, Bondora and Dadahalou study cases were used to analyse the nature of unsafe conditions in increasing the risk of disease, food insecurity and malnutrition.

## 7.2 Linking root causes to unsafe conditions

### 7.2.1 Environmental context and pastoral opportunities and limitations

As noticed in Dadahalou, Bondora and Sankal and confirmed by various reports, 85% of the landscape corresponds to mountains and plateaus composed of volcanic rocks, basalt, rhyolite which are poor, thick and very rocky (DATE 2000a, p.33). Plains such as in Hanlé 2 and Koutabouya represent 15% of the landscape inland and correspond to depressions of tectonic origin with most of these once occupied by lakes before being filled in by fluvial and lacustral sediments (pebbles, gravel, sands, clay and silt) from the quaternary age (Guedda 1989). The vast majority of the country's territory (90 to 94.4 % depending on source) is classified as pastoral lands only suitable for herding (MHUEAT 2001, p.22, MAPE-RH 2010, p.32, UNDP 2011, p.5).

In Dikhil region, there are two types of transhumance routes: *dhul ass* (literally red earth) and *dhul madow* (black earth). *Dhul ass* trails, albeit poor in nutrients, often serve as grazing lands because they are more easily accessible whereas *dhul madow* mountainous trails, usually constituted of basaltic rock and richer in nutrition content are more difficult to reach. Only 10% of the total area offered abundant pasture while 1% was left for natural vegetation cover and 0.04% was arable land. The rest is pure desert made of great sandy plains and dry lava cover combined with hilly regions exhibiting arid mountains (CRD et al. 2011, p.11-12) due to rainfall scarcity. Figure 6.5 in Chapter Six showed that the amount of rainfall found inland is quite low with quantities ranging between 0 and 122 mm throughout the year in the last seven years. In turn, rainfall fluctuations determine the availability of forage and water throughout the land. The relationship between rainfall, forage resources and water availability is now examined.

- *Rainfall and forage resources*

As discussed in Chapter Two, ecological research in arid and semi-arid areas of Africa demonstrated the key role of rainfall in the growth of above-ground vegetation. During severe aridity periods and/or droughts, patchy areas of forage tend to lose cover but recover very quickly following rainfall (Nelson 2012). Given the temporally and spatially erratic behaviour of rainfall

discussed in Chapter Six, Dikhil region's ecosystem mirrors this heterogeneous pattern. As stated in a Conflict Early Warning and Response Mechanism (CEWARN 2007) report and confirmed by ethnographic work, the region's varied landscape essentially exhibited scanty plant cover and was formed by moderately elevated plateaus (e.g. Gamaré, Yaguer and Dakka in Dikhil region) intersected by depressions only supportive of nomadic pastoral life as a viable livelihood. The region's forage productivity therefore fluctuates greatly during the year across the land except for a few 'refuge areas' in Agoa and Abhé Lake which, according to respondents, were known to offer quite good quantities of both forage and water year-round. Overall, Dikhil region exhibited a relatively unproductive landscape with dispersed localized productive patches contrary to "mesic" systems which are known to exhibit a productive profile with a few very productive patches (Galvin et al. 2004).

Because of the close relationship between rainfall and forage cover, there is also a very close relationship between rainfall and livestock productivity. For instance, a study of the effects of the 1997 drought and the 1998 El Niño rains on Maasai herders in northern semi-arid Tanzania found that the number of sheep and goats sold in 1998 were significantly related to differences in long-term vegetation patterns (Galvin et al. 2001). Another study looked at potential relationships between forage cover type (weak versus plentiful), the type and weight of herbivores and their carnivorous predators in arid savannahs. Firstly, the results indicated that there was a positive correlation between rainfall and the total biomass of great herbivores. Secondly, the population of large predators tended to closely follow the availability of prey, which was regulated by forage quantity and rainfall (East 1984). Since patchy areas tend to recover quickly following rainfall in arid environments, then it can also be the case for livestock. This was confirmed during the 1979-1980 drought in Turkana District in Kenya. At first, livestock losses of 50-70% were reported but shortly after the return of the rains, recovery from these losses was fairly rapid. Some herds had their numbers reverted back to pre-drought levels only four years after the drought ended (Ellis et al. 1988).

- *Rainfall and water resources*

Precipitation levels are insufficient throughout the country for the generation of long-lasting rivers. Rainfall both inland and from neighbouring Ethiopia contribute to recharging underground aquifers[47]. Groundwater provides 95-98% of available water resources in the country (GoD et al. 2002, p.21-22). There are two main types of aquifer systems: sedimentary (25%) and volcanic (hard rock) aquifers (75%). Sedimentary aquifers comprise both *oued* alluvial aquifers and plain aquifers as in Hanlé 2 and Koutabouya. *Oued* alluvial aquifers are situated along the main *oueds* (Gobaad and Hanlé in Dikhil region) and tend to be narrow (about tens to several hundred meters in width), shallow (between a few meters and a few tens of meters in thickness) and elongated. These *oued* aquifers strictly found in rural areas are exploited through more than 700 hand-made shallow wells and several conventional deep wells for domestic, agricultural and livestock needs, which represent about 4.2 million cubic meters per year ($m^3$/year) (Jalludin et al. 2004).

Given the intimate relationship between rainfall and underground water recharge, lack of rainfall directly impacts water access for both pastoralists and their herds. The reports that exist suggest that exploitable water sources are gradually decreasing[48] (MID 2010, p.9, Silah-Eddine 2011, p.32). A growing number of pastoralists who lack the physical and financial means to access underground water are experiencing increasing difficulty in satisfying their water needs (DATE 2000a, p.28, GoD 2001c, p.53). For instance, a study completed in rural Djibouti and published in 2010 found that some settled pastoralists were having to travel 15 kilometres and back to a water point (MID 2010, p.9). In addition, water infiltration is weak due to extreme evaporation of 2 000 mm/year (UN 2012, p.13) and due to the soil's low permeability. It was measured that only five percent of precipitations are absorbed to recharge shallow (*oueds'* sediments) and deep basaltic aquifers. Considering the very compact nature of soils, except for those aquifers shared with Ethiopia, the water recharge of underground aquifers in Djibouti relies on water infiltration from the temporary generation of *oueds*. Underground recharge from Ethiopian rains reaches about two

[47] Presently, Djibouti City's underground aquifer is the only one being monitored.
[48] Basins with water quantities per capita inferior to 1000 $m^3$/year are considered under stress. With a ratio of 50 $m^3$/year/capita, Djibouti is experiencing water shortage (Silah-Eddine 2011, p.32).

cubic kilometre/year but is not taken into consideration since it is mainly salty water unsuited for human consumption (Frenken 2005, p.208).

- *Managing fluctuations in forage and water resources*

Chapter Four and Six showed that the mobility of herders was crucial to deal with both spatial and temporal rainfall variability. It was also showed that the recurrent nature of droughts and aridity periods is a natural check on livestock numbers and its derived products (Guedda et al. 1984, p.58). Extensive transhumance was exercised along grazing routes determined by the presence of pasture and water. Latest numbers indicated that the country's total herd amounted to about a million heads, 89% of these being sheep and goats (MHUEAT 2001, p.22, UNDP 2011, p.5). At the time of fieldwork in 2013, one official working for the Intergovernmental Authority on Development (IGAD) reported that herders rarely roamed more than 50 km away from settlements in rural Djibouti.

According to my fieldwork, respondents indicated that they managed environmental checks on animal numbers by combining livestock accumulation with extensive pastoralism. Two decades ago in Dikhil region, transhumance departures used to take place at the end of March/beginning of May to follow the rains with a sufficient time lag to allow for pasture regeneration (Guedda et al. 1984, p.113). Extensive transhumance was exercised along grazing routes determined by the presence of pasture and water.

The sub-section introduced the environmental context and discussed some of the impacts of rainfall fluctuations on land cover, forage resources and water availability both at the surface and underground. The main challenges concern pasture cover decrease and diminishing underground water levels. But how did this come about? What are the underlying causes behind the difficulties facing pastoralism? The next sub-section briefly revisits the role of root causes in triggering local dynamic pressures over the land which eventually led to the appearance of rural households' current unsafe conditions.

### 7.2.2 The sedentarization process: translating root causes into local dynamic pressures

This sub-section re-introduces some of the main root causes behind the sedentarization process and its effects. Before addressing the connection between space restriction and the sedentarization process, it is first necessary to define 'sedentarization' and to differentiate it from 'sedentism'. One definition of sedentarization is proposed hereafter:

> "Broadly speaking, sedentarization is the process of individuals, households, or entire communities of formerly nomadic populations settling into sedentary, non-mobile, and permanent communities seeking alternative livelihoods. [It] is a process that operates along a continuum from highly mobile pastoral households to permanently settled households, of which individuals may move from one domain to the other." *(Fratkin et al. 2011)*

Sedentarization is thus a process by which rural nomadic pastoral households are in the process of fixing themselves at a certain spot. It is generally accompanied by livelihood diversification with the adoption of agriculture, trade and/or wage labour (Adongo et al. 2013). As implied in the second part of the quoted definition, sedentarization is also an adaptive strategy to deal with scarcer resources and pastoral impoverishment. This definition must not be confused with 'sedentism' which corresponds to the *state of being* sedentary. One important point mentioned by respondents about the sedentarization process is that communities would break up in smaller groups composed of several families who then decided to settle together instead of individual families separating and settling on their own. This sense of solidarity facilitated the settling process. In Sankal for instance, 49 respondents out of 53 (92.4%) confirmed the presence of solidarity both before and after the settling process. Still, settling groups went through (and are still going through) difficult social changes with the abandonment of traditional ties to other nomadic ethnic groups while new ties were then established with other settling groups. In addition, it was not uncommon for settled pastoralists to leave members of their families behind in case a successful rebound of livestock allowed the family members to take up nomadic pastoralism once again:

> "We left a few people behind with some of the remaining animals and we instructed them to come to follow us if they all died. At that point, we left, carrying the bags ourselves, walking day and night to reach Sankal. We were greeted here and received help from the WFP. We healed up and rested up. We depend on the

WFP now. We made our houses out of *maydhax* (tree branches) brought on our backs from Qudhacle and *karkabi* (camel skin) when they died." *(SI4, 2012)*

The explanation for the sedentarization process in rural Djibouti proposed in this sub-section is divided between historical and contemporary causes. Historical causes were deemed relevant to the colonial period while more recent/contemporary causes are relevant to the last 50 years.

- *Historical factors of sedentarization*

As a reminder of the nature of traditional land management practices in use in colonial and contemporary Djibouti, the Afars exhibit a particular conception of the land reflective of customary exchange practices, mobility as a pastoral adaptive mechanism to environmental fluctuations and the maintenance of tight social linkages within and between tribes. Each tribe was (and is) entitled to a well-delimited ancestral portion of the land which was divided and attributed to distinct families. It was an inviolable natural asset non-exchangeable with other tribes. Land management rites included payment of a tax (in nature or in kind) by foreign Afar or Somali-Ise herders to use its forage and water resources for livestock rearing (Guedda 1989). At the other end, the Ise had an opposite perception of the land. They viewed it as belonging to all. These two indigenous land use systems used to take priority over administrative rules implemented by France but their concrete application gradually waned with the application of restrictive sanctions on pastoral movement. Discussions held with state officials and respondents revealed that, depending on the nature of the decree and its impact on pastoral livelihoods, State decrees tended to supersede indigenous land-use systems. This was confirmed in some reports on the subject (CEWARN 2007).

Similarly to elsewhere in Africa (Desta et al. 2004) but contrary to the forced villagization process that occurred during the Shifta conflict in Kenya (Whittaker 2012), the colonial administration did not force nomadic pastoralists to settle. However, analogous to the British's treatment of Maasai pastoralists in Kenya (Whittaker 2012), pastoralism was seen as a direct threat to France's Westphalian notions of territoriality and statehood (MacKay et al. 2013). Colonial administrators realized that the only way to control the flow of both people and livestock was to establish national

and district level administrative boundaries and to define specific grazing areas regardless of *reer gura*[49], environmental fluctuations in both pasture land and surface water availability and ethnic territorial delimitations. Similarly to Whittaker (2012)'s remarks on the forced villagization process during the Shifta conflict in Kenya, the colonial regimes' vision of cross-border nomadic pastoralism as detrimental to law and order and therefore illegal was then passed on to emerging 'westernized' neighbouring States, including the Djiboutian State.

The problem of space restriction in Dikhil region and rural Djibouti in general is that its territory is mostly constituted of summer pasture lands which are ephemeral and scarce in fodder quantity since they heavily rely on inland *karan/karma* rains for growth. Consequently, the exploitation of these short-term pastures meant that herds could not remain in these areas for extended periods of time. As reported by Guedda (1989, p.8) and confirmed by respondents, seasonal failures in rainfall and decreases in pasture and water in both quantity and quality accessed would often force pastoralists to cross over the Ethiopian and Somali borders into neighbouring refuge lands of the Issa ecosystem. Refuge pasture lands, also called 'fall-back' lands (Desta et al. 2004), are pasture lands located at higher altitude which tend to offer sufficient fodder all-year round.

From the early 1900s onwards, colonial authorities built water points and market centres such as in Dikhil city. As the political and economic power centre gradually migrated from rural areas to the capital, nomadic households eventually settled along the railway in various villages set up in areas previously unsought by herders because of their very low pasture productivity. The construction of roads, transportation networks, administrative posts and water points and the availability of veterinary services encouraged nomadic communities to settle throughout the country. According to Guedda, the rate of sedentarization was strongest in the South (including Dikhil region) where pastoral households were more influenced by the birth of towns, the road linking Djibouti to Ethiopia and the railway (Guedda 1989, p.10). As explained in Chapter Four, power transfer to the capital and sanctions on 'illegal' movement of herds gradually weakened the traditional system's legitimacy. For instance, traditional rules of *mise en défens*[50] were increasingly

[49] *Reer gura* in Somali corresponds to the seasonal movements of nomadic groups.
[50] *Mise en défens* is a French term which designates a pastoral regulating injunction consisting in forbidding grazing of a certain portion of the land for some period of time to allow pasture to regrow and to preserve its fertility levels.

ignored. As families settled, herders started to practise an incomplete form of transhumance which led to long-lasting repercussions on pastoral traditional modes of life (Guedda et al. 1984, p.52 and 65, Piguet 1998, p.276-277, Desta et al. 2004).

- *Contemporary factors of sedentarization*

Similarly to the colonial administration before Djibouti's independence, the government did not force pastoralists to settle through policies aimed at reducing their herd size and/or limiting their movements. Djibouti's extreme aridity conditions, the absence of surface water currents and strict reliance on underground water from wells have led to rather heterogeneous forms of sedentarization with no specific time-line nor general trend in the phenomenon. These processes are similar to the sporadic sedentarization process which have occurred in Northern Kenya (Nduma et al. 2001, Coppock et al. 2013) and West Africa (Adongo et al. 2013). The settling process in rural Djibouti accelerated through most of the 20$^{th}$ Century.

At first, animal numbers first increased with easier access to water and complimentary feeding accessible on the market but later dwindled due to diminishing pasture cover and growing water scarcity. Semi-sedentary pastoralism and spatially concentrated animal growth was not sustainable in the long run for three main reasons. Firstly, the lack of rehabilitation and maintenance of engineering works undertaken during the colonial period gradually undermined water access in contemporary times. Secondly, pastoral corridors were increasingly overstocked and pasture lands shrunk which in turn lowered herd productivity and the size of individual livestock holdings. Thirdly, there was simply not enough quality pasturage and water to maintain herds of sufficient quantity and quality for household sustenance. These impacts from the sedentarization of nomads are not unusual and have been discussed in other studies completed in other ASALs (Schwartz 2005, Galvin 2009, Tafere Reda 2012, Coppock et al. 2013). As a result, signs of a pastoral economy on the decline gradually appeared as rural households struggled to maintain their auto-subsistence through temporary settling often ending up being permanent (Piguet 1998, p.163). Although contemporary causes of sedentarization also included the attractiveness of villages and

It is usually declared and put in place by a *Dardar* (Afar tribal chief) with authority over the land. When put in place, foreign Afar tribes and Somali-Ise tribes must respect the injunction.

urban opportunities, the main reasons stated by respondents are connected to 'symptoms' of social-environmental dis-equilibrium.

The respondents in Sankal described the way in which they became sedentarized and the subsequent impacts on their lives in the following way. Most Hanlé 2 households settled 40-50 years ago with the specific intention of cultivating. Sankal and Bondora pastoralists, however, settled as a result of having permanently fallen out of nomadic pastoralism. Thus, the livelihood profiles found in the study sites somewhat differed because of differences in the history behind the creation of the villages. This finding concurs with that of Fratkin and Smith (1995). Overall, the qualitative data pointed to the three following reasons behind the adoption of sedentarization as an adaptive strategy.

The first and main reason was loss of animals, as also reported by Isse (2012, p.95). The majority of my respondents stated that before settling, they had a lot of livestock of all types including cattle, goats, camels and donkeys. They used to sell livestock for cash to buy rice, sugar, flour, pasta and other supplementary foods. Milk and milk-derived products such as *subak* (butter) and meat products were plentiful. Donkeys were used to carry various articles and especially water. In case of a drought, they used to sell part of their livestock at certain times and stay near wells until the drought passed. According to respondents, sedentarization is the last strategy left to adopt after severe losses of animals. They viewed it as an impoverishment process as they became dependent on their urban relatives, on irregular help from the State and on humanitarian assistance. In Sankal, respondents indicated that life was much better and plentiful before compared to after they settled:

> "Before, I had a lot of cattle, sheep, camels, goats. When the rains would come, the animals would eat the grass and we would get milk from the animals. But if they didn't eat any grass, then they didn't produce any milk. Sometimes we would sell the animals in the city and buy food with the money. We would travel with the camels, carry water thanks to the donkeys and drink goat milk. [Now] there's nothing. We only wait for the WFP. There are a few people who have some goats left. We don't know how to live without livestock." *(SI24, 2012)*

> "I had around 200 animals of every kind. Only a few goats are left. Life was better before but now, we do not have anything and we cannot get what we need. Before, we used to sell our animals to buy food and

clothes. We also used to help each other but now it is hard because we have lost most of our animals." *(SI27, 2012)*

During data collection, the number of surviving livestock in the study sites and particularly Bondora and Sankal was very low. In Sankal, 30 respondents out of 48 (62.5%) lost the totality of their animals. Those that still kept livestock (39.6%) had between one and five goats (with one who reported having a donkey). In terms of assets or physical goods that could be sold or exchanged, the overall majority of them stated not possessing any more than a radio and/or sleeping carpets. As a result of this state of destitution, villagers tended to view children as their only true long term remaining resource. They hoped that through education, their children would integrate more easily to the urban economy and then help their respective families by sending remittances.

The second reason evoked by respondents is that sedentarization represented (and still represents) an opportunity for them to temporarily or permanently diversify their livelihood base with wage labour (house cleaner, watchman, security guard, etc.), handicrafts making, livestock and derived products (milk and meat) marketing, or farming/agriculture. Similarly to the Samburu (Ayantunde et al. 2011), respondents indicated that if settling did not help pastoralists to rebuild their herds and/or improve the household's economy, young men were sent to the cities to work as guards.

The third reason is that the government provided incentives for Sankal and Bondora pastoralists to settle and stay in these villages, such as the construction of boreholes which provided year-round water access and a school within easy reach of the community added to the distribution of food aid by the WFP. These incentives also played a significant role in the permanent sedentarization of the Ariaal and Boran of Marsabit Mountain (Fratkin et al. 2004, Fratkin et al. 2011) and the Kutse of the Kalahari (Kent 1991). In the case of Sankal pastoralists, government officials were those that told them to settle in Sankal and that they would subsequently be taken care of by the State. Yet, as reported by the following respondent about a water project, not all promises were actually kept:

"The former commissary, Moussa Djama, told us that every *qaxoonti* (refugee) *reer guuraa* (moving families) who lost their cattle should go to Sankal and that's where the *dawladda* (government) will take

> care of us. As a result, they drove back all those nomads that were in Dikhil towards Sankal. They promised that they would make wells here. They said that here in Sankal, there is good land for wells and agriculture. Well, forget all this. We are starving and thirsty here." *(SI9, 2012)*

Given that access to water, more than anything else, is such a determinant of welfare in this environment, and that people had made life-changing decisions to settle on the basis of these promises about water, failures in fulfilling them are extremely worrying and undoubtedly contributed to people's subsequent levels of vulnerability in the study sites, as will be further demonstrated below. Many did take advantage of the schools. For example, in Sankal study site, 38 households out of 41 (92.7%) sent their children to school. The main reasons why parents sent their children to school were because they believed that in the long run, when children graduated, they would be able to find a job more easily and then be able to contribute to the survival of their families. Some stated that because of their young age, children were better off going to school where they could benefit from the WFP's school meals (breakfast and lunch).

The following sub-section examines the environmental impacts caused by the sedentarization process leading up to the appearance of unsafe conditions.

### 7.2.3 Sedentarization's impacts: bridging local dynamic pressures with unsafe conditions

Although sedentarization took a variety of forms throughout East Africa, its environmental consequences were fairly uniform. This sub-section unveils the consequences linked to the sedentarization process on pasture lands and water resources in rural Djibouti. The third part closes the sub-section by informing the debate on pastoralists' responsibility for environmental degradation in rural Djibouti.

- *Semi-sedentary pastoralism and pasture lands*

In the study sites, herders with settled households who still had a significant number of animals still practised some transhumant pastoralism. This form of pastoralism was defined as semi-sedentary since part of the households (elderly, women and children) would remain in the village

while herders would regularly leave to graze their animals away from the homestead. However, the distances covered were much lesser[51] in coverage than before. At the same time, herders have had to increase complementary feeding for livestock which included *dourra* and maize for transhumant herders, and grass and acacia leaves for sedentary pastoralists. The type of complimentary feeding depended on their availability and access on the market (Guedda 1989). Unsustainable and unviable in the long run, it led to repercussions on ecosystem services. In the 1960s, it was reported that livestock numbers in rural Djibouti were already much too high and exceeded the carrying capacity of the land (Mohamed 2006). However, is it credible to use the term 'carrying capacity' in the context of a non-equilibrium environment such as rural Djibouti?

Pastoralism sustainability and land overstocking are very hard to estimate because the environment constantly changes, there is high and frequent mobility of both animals and households and there is difficulty in defining the pastoral system's boundaries (Ayantunde et al. 2011). It follows that the risk of over-evaluating stocking rates and miscalculating land carrying capacity thresholds at any given moment in time is extremely high. For instance in 1964, ecological experts estimated that Somalian pastoral trails had reached saturation levels when in fact another survey performed in the dry season following the 1973-1975 drought found that there was two and half times more animals (Guedda et al. 1984, p.61). According to one particular study done on pastoral dynamics in the HoA, carrying capacity can be defined as follows:

> "Carrying capacity is determined by the configuration of wild (and domestic) fauna, the number and weight of organism species and of given quality that can survive, without contributing to its deterioration, in a given ecosystem, in those environmental conditions most favourable and likely to occur in the course of a given time period". *(Translated from French, EURODICAUTOM database quoted in Piguet 1998, p.167)*

This definition describes the close relationship between the quantity of vegetation, available water quantities and livestock density, both in number and composition (Piguet 1998, p.167), which was also covered in section 2.2.3 of Chapter Two and section 4.3.3 of Chapter Four. However, does this apply to the ASALs? Respondents confirmed that livestock populations were usually limited and controlled by the availability of forage in sufficient quantity and quality in the dry season. This

[51] As noted by Piguet (1998, p.170) and confirmed by respondents from all villages, herd mobility rarely went beyond 50-70 km in Dikhil region and the rest of the country.

is also the key point that differentiates the stable environments found in temperate zones from the ASALs. Seasonal fluctuations in rainfall amounts, temperature and evapotranspiration rates (also called stochastic disturbance) in rural Djibouti alternate between wet and dry periods, as shown in Chapter Six. In turn, these fluctuations are mirrored by animal number patterns (Behnke 2000). This observation was described in the following quotes by respondents:

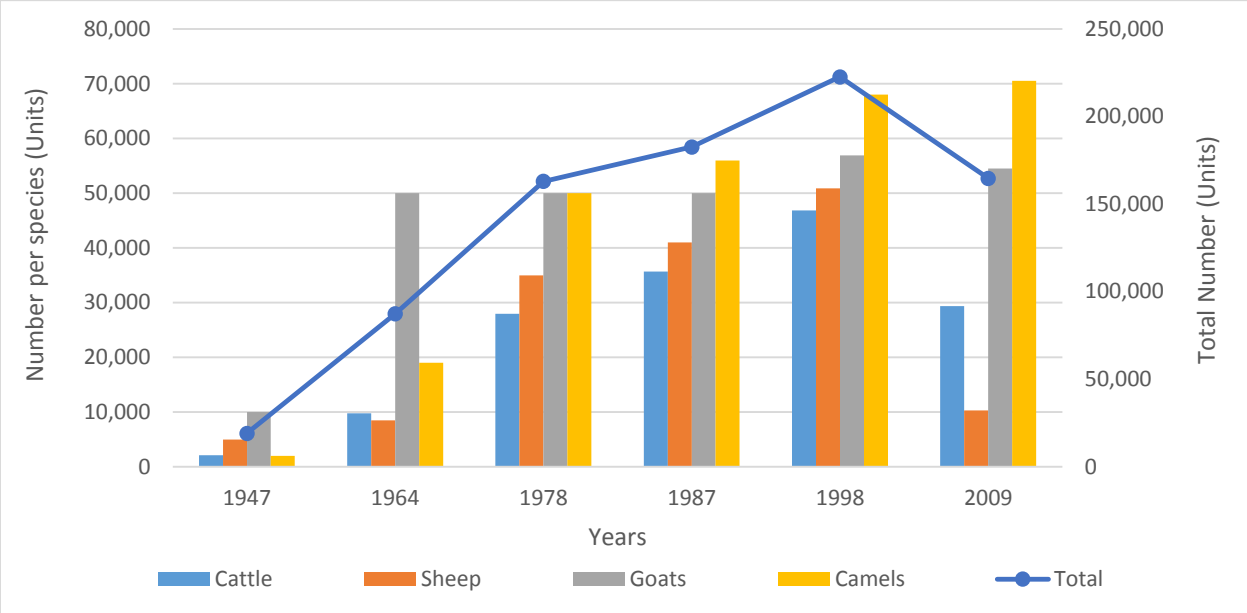
> "We experienced many droughts. I've always known drought. Usually, the rain would come back once in a while. But this drought is awful. It didn't come back. It's awful. This drought and the previous two were very bad. The worst drought is this year with heat and all the other consequences." *(SI16, 2012)*

> "I have known droughts since I was a kid. We used to survive them. Rain would come back and then drought would come back but animals were always left so as to rebound again. We used to live in the countryside. We don't like refugee places. We prefer to preserve our livelihood. However this drought, is not ending because rain is not coming back. This autumn is not stopping. We haven't had any rain at all. All the animals have died except this goat. The goat and I eat the same thing." *(SI31, 2012)*

Similarly to other non-equilibrium environments (Behnke 2000), respondents validated the fact that periodic imbalances in the supply and demand for forage were closely correlated with fluctuating periods of high and low stocking densities. Rainfall fluctuations ensured that livestock populations were constantly out of synchronization with their food supply. Natural checks ensured that livestock lost weight in normal dry seasons, reproduction rates plummeted during poor years while die-offs occurred during multi-year droughts. It was further found that the rate at which an animal died was determined by the dry period's duration rather than by the number of animals which suffered from it. Consequently, the 'carrying capacity' concept cannot apply to rural Djibouti (except if it refers to different carrying capacities at any given moment).

As described earlier, the sedentarization process led to a gradual increase in the number of animals in spatially concentrated places. It is argued that the sedentarization process as well as easier and more frequent access to water and market centres removed natural checks on both animal and human populations. One proof of animal increase due to historical causes of sedentarization discussed earlier during Djibouti's colonial period is illustrated in Figure 7.1.

**Figure 7.1 Estimated livestock species variation in rural Djibouti from 1947 to 2009**




*Source: TLU calculations and graph by Author based on numbers from CRD and CRB, 2011, p.13*

Animal and human growth were supported by easier access to water and complimentary feeding from markets. At the same time, pasture land cover and water resources were going through fluctuating periods in relation to rainfall variability. As Figure 7.1 shows, the total number of animals increased from 1947 to 1998, adding pressure on already scarce pasture lands and water resources. As a result, the available quantity of natural resources diminished for both settled and remaining nomadic groups alike. The reason why herders kept on accumulating animal herds regardless of diminishing pasture land cover and water was already discussed in Chapter Four and are briefly re-stated here. Firstly and as remarked by Herskovits (1926), livestock are socially important and traditionally viewed as wealth to be preserved, exchanged and passed down. Secondly, it is an important symbol of pastoral identity. Thirdly and as remarked by countless studies (Guedda et al. 1984, p.39, Fratkin 2001a, Schwartz 2005, Vetter 2005, Næss et al. 2010, Nelson 2012, Næss et al. 2013), livestock accumulation itself represents a protective adaptive mechanism against possible losses linked to unpredictable environmental fluctuations.

Unlike Somalia, in parallel to this increase in the quantity of livestock, there was no social-environmental re-balancing between animal numbers and resources since animal excesses were not sold and/or exported out of the country due to the unfair terms of trade faced by local

pastoralists discussed in Chapter Five. As a result and suggested by Silah-Eddine (2011, p.32), there was an increasing disequilibrium between the quantity of natural resources (pasture and water) and the consumption needs of livestock. This might explain the downward trend in animal numbers due to decreased availability of forage and water from 1998 onwards. As explained in Chapter Five, fieldwork indicated that as pastureland cover decreased and environmental conditions gradually worsened, pastoralists progressively changed the species configuration of their livestock. As it is more difficult to satisfy the needs of bigger animals (cattle and camel), pastoralists increasingly preferred keeping small livestock (goats and sheep) of lesser commercial value but of greater short-term benefit for the survival of pastoralism. Although sheep and especially goats are known to be destructive of pastureland when grazing in concentrated locales, they have a short, rapid and prolific reproductive cycle which means they can reconstitute themselves more quickly than cows and camels in the face of environmental fluctuations. Traditionally, the men were in charge of keeping the bigger animals while children were more in charge of smaller animals. As the size of herds dwindled and preference for sheep and goats grew, so did the participation of women and children in livestock keeping. The impacts of changes in species composition on the configuration of household labour division is further discussed in Chapter Eight.

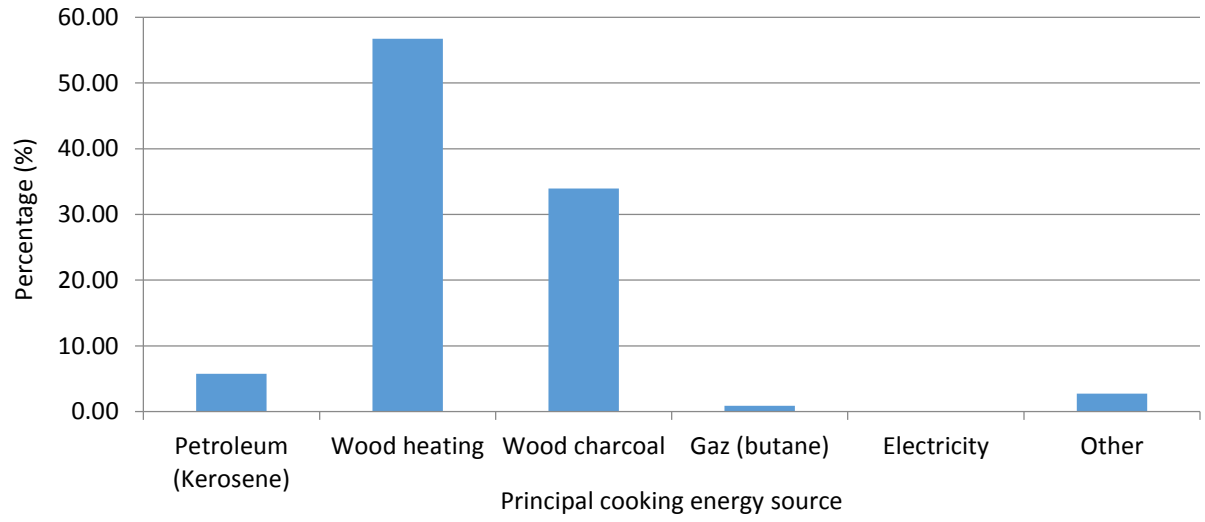
At the same time, urbanization led to increased peri-urban livestock production without any structurally organized commerce for it. The majority of animals exported to the Middle-East mainly originated from Ethiopia and transited through the port of Djibouti (Mohamed 2006). Confronted with lower livestock quality compared to neighbouring Ethiopia and Somalia, lack of marketing infrastructure and rising prices of foodstuffs (Chapter Five), nomads had increasing difficulty trading their livestock products for cereals, tea and sugar as exemplified in this quote:

> "We used to have cattle, camels and cows. We used to drink all kinds of milk and meat. We would sell a few and then get food. Now there are very few people with animals. When they go to the city and sell the animals, they have trouble buying the food because it's too expensive. A full pack of sugar would cost 1100 DJF. Now we don't have anything. We came here these last few years. There are just a few camels left and they are about to die soon. Before we used to have rain and grass for the animals but now there is no rain coming and there is no grass. Only the rocks are left. If you try to walk around here, you won't see any grass here." *(SI31, 2012)*

In addition, both Guedda (1989) and the author's qualitative research indicated that exchange of livestock products between rural communities and the urban population was close to non-existent. Consequently, as their purchasing power decreased, rural households became more and more dependent on their urban relatives (who may give up between 50% and 80% of their monthly salary as remittances!) and on food aid from the WFP. This form of sedentarization led to a double problematic: it did not economically encourage the rural producer and represented an economic burden for the urban relative which could lead to his or her impoverishment and reduced purchasing power (Guedda et al. 1984, p.82). There was still some local occasional commerce that was practiced but these small peri-urban initiatives were evidence of a gradual pauperization process rather than evidence for wealth generation.

In terms of the impacts on vegetative cover, the increasing number of settled pastoralists also translated into in an increase in households' needs for wood. Prior to settling, they used to cut and use wood as they moved over the land. With sedentism, women and children had to fulfil their households' needs by exploiting nearby vegetation cover (DATE 2000a, p.56-57, GoD et al. 2002, p.55, Silah-Eddine 2011, p.30).

**Figure 7.2 Principal source of energy of rural households in Djibouti**




*Source: The data were extracted from the DISED, 2012, compiled and analysed by the author*

As shown in Figure 7.2 and confirmed by respondents from the study sites, a survey of 15 333 rural households showed that the use of wooden branches for cooking, heating and charcoal

production represented a major part (91% with 56.7% for heating and 33.9% for charcoal) of their livelihood. This component of pastoral livelihoods, once sustainably exploited[52] added fuel to the current deforestation and desertification processes in rural areas (DATE 2000a, p.63). In 1985, it was estimated that in four rural districts (excluding the cities), close to 22 500 tons of wood (about 1 875 000 branches of wood weighing approximately 12 kg each on average) were consumed. This consumption went up to 2 662 500 wooden branches in 2000, which represented an increase of 42% (DATE 2000b, p.51). This increase had detrimental effects on the environment, the soil and even on the associated micro-climate which is generally a product of intricate feedback loops between vegetation cover and atmospheric processes.

Previous reports (GoD et al. 2002, p.21, MID et al. 2006, p.6) and data collection in 2013 revealed that there was unequivocal recognition by state institutions and international organizations that vegetation cover (about two percent of the country's territory) was decreasing which seriously jeopardized the survival of livestock rearing. As a result of de-regulated exploitation of the land, feedback loops within the ecosystem were triggered with progressive mutation of the vegetation in its content, structure and distribution. As seen in Chapter Six, these changes in land cover could have had an impact on the nature of the soil and provoked a reduction in the production of cool air necessary for successful convection for the formation of rainfall in affected areas (Mohamed 2006). It is therefore postulated that this prolonged dis-equilibrium between household needs, livestock needs and ecosystem services combined with normal recurrent aridity and drought periods to reinforce the current desertification process.

- *Impacts on access to safe water*

In times past, environmental conditions were in balance with pastoral activities. As seen in the earlier section, the progressive settling of rural nomads in fixed places was facilitated around water points, schools and villages. As a result, sedentism combined with demographic growth considerably increased the use of groundwater resources in the last decades. In particular, this

[52] Before, dead wooden branches were collected and used for energy because cutting branches of living trees (such as acacias and others especially in the North) without the permission of a tribal council was considered a crime. Hence, pastoralists already knew that it was non-environmentally friendly to cut living trees. Even though the practice was forbidden by the State, the law is not fully applied in rural areas.

increase was due to the development of Djibouti City and inland cities, the unending rural-urban exodus, and the implementation of agricultural and livestock programmes.

In 2004, 49.1% of rural households had access to water but only 60.8% of the demand from people, agriculture and livestock were being met (FAD 2004a). Among those who had access to water, 30% relied on traditionally hand-made wells in terrible hygienic conditions (GoD et al. 2003, FAD 2004b). Other relied on water sources more than 10 km away from the settlement (FAD 2004a, GoD 2007). Despite the lack of reliable data on the underground aquifers' recharge rates, projects were undertaken to improve water access by capturing water runoff through the creation of sporadic water basins over the land and wells. Increased water extracted from underground sources gradually diminished its quality leading to public health implications. Reports have indicated that excessive pumping led to underground water salinization way above international norms established by the World Health Organization (WHO) of one to two grams per liter (g/l) (GoD 2007, p.17). A number of boreholes registered over 1200 mg of chlorides per litre (Jalludin et al. 2004, Frenken 2005), which was six times higher than the norm set by the World Health Organization (WHO) (Silah-Eddine 2011, p.31). In addition, even though recharge rates are unknown, regular yearly water measurements seem to indicate that there is a decline of water tables and an increased risk of underground water pollution[53] (Jalludin et al. 2004, MID et al. 2006, p.3, UN 2012, p.13). In the long run, such salt concentrations represent a strong risk of contracting 'cardiovascular illnesses tied to hypertension and renal illnesses' (FAD 2004b, p.2).

Yet, despite the fact that access to water is one reason for people to sedentarize, the outcomes in reality in rural Djibouti are highly problematic. Fieldwork found that depending on the size of the family, the age-structure of the household, their respective occupations and/or the location of the settlement, a significant number of hours (up to two-thirds of the time), was dedicated to fetching water from two to seven times a day which was that much time spent away from other household members. Respondents indicated that they would fetch water from various places like Sankal, a nearby borehole, Siyal, the Ethiopian border, Gobaad or Casuuli. For those families with children enrolled in school, part of the water collected was used to replenish the school's water supply. It

[53] Another bacteriological study completed in 2009 on a sample of 97 rural water points showed that 73% of water sources were polluted (Silah-Eddine, 2011, p.58).

was mainly used for human and animal consumption and there was often not enough for washing. As an increasing number of rural pastoralists settled, the water quantity and quality at various water points in the region severely decreased. Consequently, women and children needed to cover great distances to satisfy their daily needs. As a result, women often reported suffering from backache and pain in the joints:

> "[H]ave you seen our girls? They are twenty years old. That's because of the water bottles they carry on their backs. Look how awful they look. They cough. They walk kilometres away until the Ethiopian border. That's where they get water. We will leave this country and go to Ethiopia where these people might kill us. The water level in the well near Ethiopia is decreasing. The cattle and we drink the same water. There was one well where a guy got wounded as the well collapsed on him. We took him to the hospital. The worst thing we suffer from is thirst."*(SI4, 2012)*

Fetching water was a cumbersome and physically demanding task for children and women. It was not uncommon to learn that there were miscarriages of pregnant women due to long round-trips to fetch water combined with insufficient food intake:

> "We help each other with the water. I get the water from wells that are very far away, near the Ethiopian border. Now, my back is hurting because of that and I know that I will feel the pain all night long. Tomorrow, I will have to wake up again, prepare the breakfast. The children are not strong enough yet and go to school. When they get back, I ask them to get the water. We can't wash their clothes because of lack of water. We don't take showers either because we don't have enough to drink. We suffer from thirst and hunger." *(SI13, 2012)*

In Sankal, women had organised themselves; every five families shared a donkey while the strongest individuals would carry the jerrycans themselves. Usually, the donkey was shared between families composed of a majority of young, old and sick household members. Even though great distances needed to be covered for water, households did not move closer to other wells because some of their children were registered in school and therefore could benefit from both the WFP's food meals on a daily basis and from education in the longer run:

> "All the women's back hurt from carrying the water. We used to get water from the wells in Sankal but now all the water is gone. At that point, we wanted to move closer to the wells near the Ethiopian border but unfortunately, that wasn't possible because the school would have been too far. The women and the

> children get the water. They also bring some of that water to the school. If not, they would not eat at the school. My wife gets the water four times a day." *(SI9, 2012)*

Children were also in charge of fetching water from a very young age, as soon as they were capable of carrying one jerican of one or two litres. Those registered in schools also fetched water for the school's water tank (except those in Hanlé 2 where they had access to water through a hosepipe connected to the village's reservoir). In Sankal, it was not uncommon for children to interrupt the interviews dealing with water collection. One boy in particular stated:

> I get the water three times a day, twice for the house and once for the school. All the students get the water to the school. I start at 7:30 so I wake up at 3:00 am to get the water. That water is for the food to be cooked. The water in the white tank is given by the military. Yesterday, I went four times to get the water. Last night I woke up at 4:00 am because mom wasn't here. She heard that some aid agency was giving some food some place. It takes two hours to get to the well. Since it is not our well, we have to wait until we can get some water. A lot of people go there every time. We wait our turn and get the water by hand. Unfortunately, there is not that much water in the well. We sometimes wait until three hours near the well." *(SI15, 2012)*

As exemplified in these quotes, respondents (male and female) from all study sites indicated that women and children were those in charge of fetching water for the household and the school for families whose children were enrolled. At the time of data collection in Sankal in 2012, it was found that although most men regarded fetching water as part of a woman's responsibility, women respondents indicated that 41.9% of men helped them in completing the task. The other 58% were idle in the village. 22.2% of them had left the village for various reasons (search for healthcare, job or for family matters). Before settling, pastoralists used to load water filled jericans on donkeys' backs to carry it. Their extinction forced households to organise themselves in fetching the water from wells that were between one and three hours away from the settlement.

- *Environmental degradation: who to blame?*

This section has shown that different historical and contemporary factors of sedentarization have combined and eventually led to drastic environmental consequences on the land. Despite these findings, fieldwork in Djibouti city suggested that the perception that pastoralism is a primitive

land-use system, environmentally unfriendly and responsible for the 'disappearance' of vegetative cover and soil degradation (Rabeh 1989, Ayantunde et al. 2011) has endured. Pastoralism, often seen by state officials as a primitive mode of living in opposition to modern urban life, wrongly became the principal scapegoat in a debate over the assumed unsustainability of livestock accumulation practices by herders (Greene 1974, Nathan et al. 1996, Fratkin 2001a). For instance, according to the late Omar Osman Rabeh, Somali philosopher, writer and key player as Djibouti's presidential adviser, pastoralism is antonymic to progress and modernity as well as in discordance with the natural ecosystem:

> "[The nomad] does not have any direct contact with nature. The animal is placed between the latter and the former as a 'live factory', autonomous, which delivers its ready-to-eat 'products': milk, meat, skin, etc. Hence it follows that man does not know nature and vice versa. [He has] a circular understanding of time which especially excludes linear progression, and an undefined space, forever lost and rediscovered; and therefore lacking unity and therefore reality. […] From the mediating role of the animal implies for the nomad a sense of total freedom to which he is so firmly attached. This absolute freedom that does not suffer any kind of restriction only means absence of contact and knowledge of matter; which is inextricably linked to the coordinates of space and time that define the framework of any being and activity." *(Rabeh 1989, p.96)*

Rabeh's vision of the "nomad mentality" as he called it is in opposition with the observations made during fieldwork. It is true that nomadic herders presented a territorial conception that was relatively fluid and regularly negotiated (especially for the Somalis). However, such a vision which was different from westerners' early perception of territoriality based on spatial science indicators of time and space, does not necessarily mean that nomadic pastoralists did not have an accurate appreciation and understanding of environmental dynamics. This is particularly the case when interviewees were asked to interpret the early warning signs of drought occurrence (including the adaptive mechanisms of Chapter Four that they developed over the years). According to respondents, there are a variety of abiotic and biotic signs that translate changes towards drought conditions.

The first signs were abiotic and first included the prolonged absence of rain and the absence of palatable grass for livestock. Usually, pastoralists would leave pasture lands before the end of the rainy season to favour future forage re-growth. If lack of rainfall persisted, the ground would

become dusty and dry and darkened with increased prevalence of rocks throughout the landscape. The rare trees encountered would change in appearance as they progressively dried up. In addition, wells and boreholes normally accessed along migratory routes usually exhibited varying water levels depending on the season. Nights, especially during the *jilal* dry season from November to February, tended to become windier and colder when dry conditions persisted.

The following signs reported by respondents were biotic in nature and first manifested in decreasing quantities of milk extracted from livestock and therefore decreasing amount of *subak* (butter in Somali) consumed. In addition, animals usually showed increasing signs of physical weakness with diminishing carrying ability, increased malnutrition, and higher disease frequency. Coughing blood, diarrhoea and *noris* (haemorrhage, bleeding in Somali) were often reported as serious early signs of drought conditions as they weakened. They would eventually exhibit declining mobility capability. Usually, the cattle were the first to die, followed by the sheep, the goats and the camels. However in the last decade, pastoralists usually owned a lot more sheep and goats than camels. Therefore the rate at which these specific animals were lost in both number and frequency were the best biotic indicators of how bad a drought was. Eventually, if animal numbers did not rebound, sedentarization was taken up as the only adaptive strategy that could delay total annihilation of the herd and impoverishment of the rural household.

Since pastoralists are the only ones interacting with the natural environment in rural Djibouti, it might be correct to accuse them of degrading the environment. However, the farther in time the problem is investigated, the weaker the accusation becomes. Optimal land use in Dikhil region used to be conditioned upon its adequate management by the indigenous land use system rather than livestock production *per se*. Despite the fact that in the short-term, facilitated access to water and veterinary services improved animal health with positive effects on household livelihoods, colonial and State interventions in *badia* (countryside in Somali) indirectly meddled with natural checks on human and animal numbers. These checks included seasonal fluctuations in water and pasture availability, livestock and human disease and death. In the long run, a spiral of prolonged ecological dis-equilibrium in a non-equilibrium environment was begun which manifested in overexploitation of pasture and water resources and further pastoral impoverishment.

Another important point is that an increasing number of pastoral households and animals were living through episodic droughts within a restricted space (Piguet 1998, p.169). Pastoral adaptive mechanisms (including livestock accumulation) which used to be viable in the past led to overgrazing in recent times. The land was not given enough time to re-grow and re-expand. As pastoralists' livestock depended directly on the availability of forage, the progressive retreat of pastures posed a serious challenge to pastoral livelihoods and the people that depended on it. Study reports (MID et al. 2006, p.6, MID 2010, p.9) and informal discussions with herders did show that there was still trans-border movement, especially toward the Shinnile zone in Ethiopia and in Northern Somalia. Yet, Djiboutian herders could not always reach some of the 'refuge pasturelands' in neighbouring countries because firstly these lands would also be going through severe aridity periods of their own and secondly for insecurity reasons.

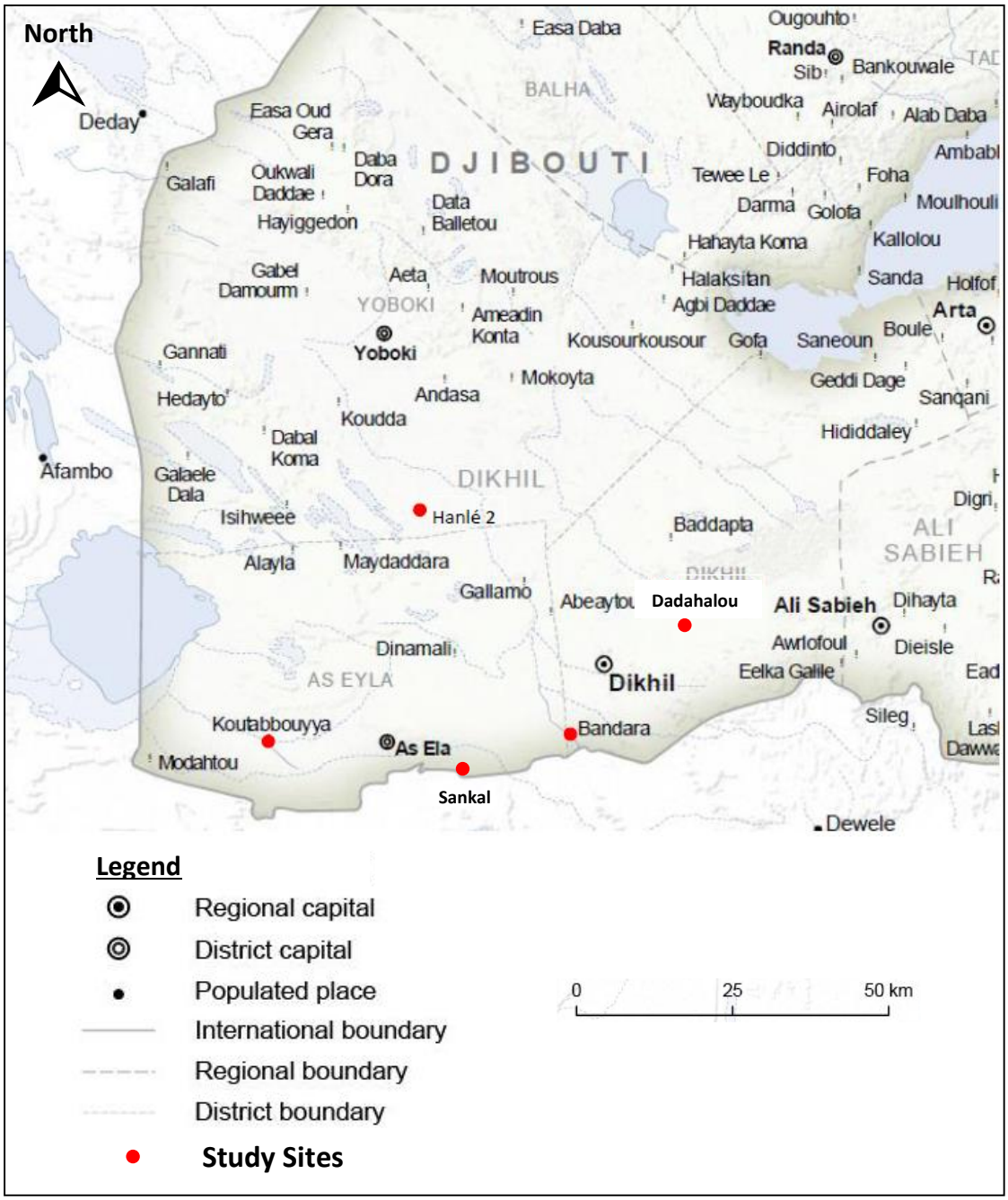
It is suggested that a return to an extensive version of nomadism associated with greater regional mobility (as it was practised in pre-colonial times) and re-establishment of *mise en défens* rules would improve both soil properties and water infiltration. As suggested by Allington and Valone (2010), such initiatives would constitute an appropriate response to summer pasture land saturation within rural Djibouti. This section has shown the linkages between root causes of sedentarization, reinforcing impacts of sedentarization itself as a local dynamic pressure and adaptive strategy to environmental fluctuations and its role in the progressive appearance of unsafe conditions. Participatory fieldwork was undertaken in Hanlé 2, Koutabouya, Bondora and Dadahalou to uncover the details of these unsafe conditions. These are discussed in the next section.

## 7.3 Living in unsafe conditions: case-studies

To extract exploitable information about unsafe conditions of living in Hanlé 2, Koutabouya, Bondora and Dadahalou, participatory tools part of the Participatory Vulnerability and Capacity Assessments (PVCAs) toolkit were used under the guidance of the author. Firstly, the community profile exercise permitted members of group sessions to identify the geographical and demographic elements specific to the village, the social structures in place, the existing livelihood profiles and the nature of and access to social services such as healthcare and education. Secondly,

to have a better appreciation of the state of pasture lands and the villages' internal resources, a participatory cartography exercise was organised whereby respondents were asked to represent (whether on flip-charts or in the sand) spatial information about infrastructure and resources as well as indicate risky zones and the locus of vulnerable households.

**Figure 7.3 Dikhil region and study sites**




*Source: The study sites were added by the author to this map from UN, 2013*

Afterwards, the figures were re-drawn by the research team before being cleaned and refined by the author. The results of these group sessions are shown in Figures 7.4, 7.5, 7.6, 7.7 and 7.8. In all study sites, it was remarked that participants did not experience any difficulty with the conceptual exercise of representing both their village and transhumant movements on a map. However, it was not possible to locate those most vulnerable to drought impacts for two main reasons. Firstly, households were spatially mixed with no differentiation in social class and/or financial status except for the village's chief who lived in a well-built *daboita*/*toukoul* usually well-located in the village near a water point, reservoir or the school. Secondly, villagers and especially those known to be more vulnerable felt uncomfortable singling out one of their own as particularly vulnerable. This was interpreted as a strong sense of solidarity between households and sense of ethnic belonging which were interpreted as a solid social asset.

### 7.3.1 First case-study: Hanlé 2 village

The population of Hanlé 2 carried a cultural heritage closely linked to the land and the practice of pastoralism. The population was Afar which was the language of communication in the entire village. Among those encountered, most neither spoke nor understood French. A few of the notables did speak Somali. Being from the Adorasoul clan, the traditional Afar customs covered in Chapter Four governed land attribution and settlement locations of households. Consequently, all Hanlé 2 households were originally from the area and presented very strong tribal linkages with their ancestral land. Both transhumance herding and agriculture were practised by most households.

Even though the settlements were relatively close (about ten km) to the main road which facilitated access to means of transportation (auto-stopping, buses) and markets, they remained quite isolated in a hostile environment. According to respondents, the number of settled households in Hanlé 2 was about 300 at the time of data collection in 2013. This was confirmed by my frequent visits to the village whereby more than a hundred *daboitas* (dwellings) were identified in the village. Whenever discussion about the approximate number of households living in the village arose, they said that those that lived close to the *Gamaré* Mountains of Dakka shown in Figure 7.4 also considered themselves part of Hanlé 2. Moreover, some that lived in neighbouring Hanlé 1 and

Hanlé 3 also came to cultivate their agricultural plots in Hanlé 2. It was therefore very hard to get an exact population number since there was often movement of people between villages.

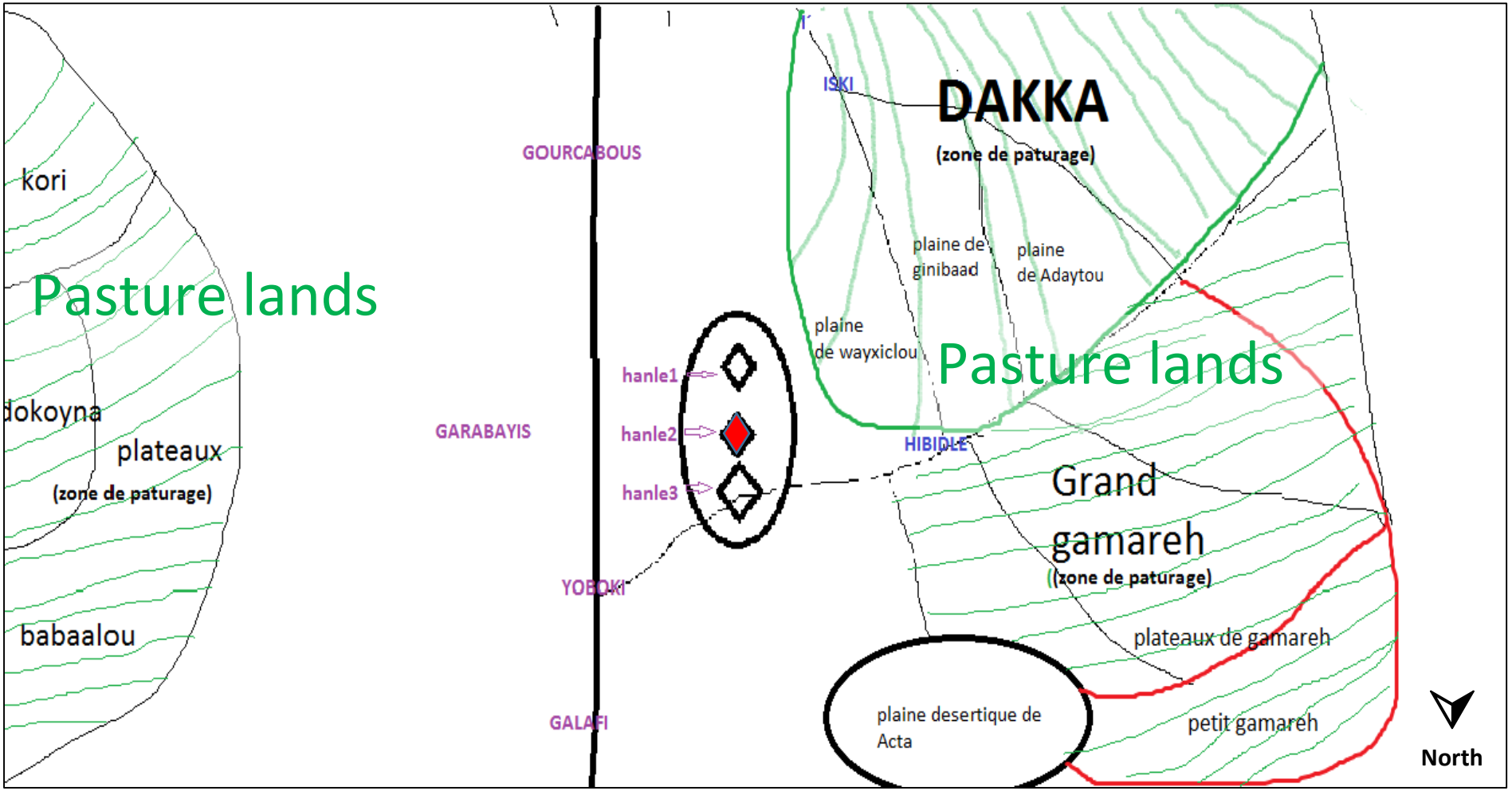
People lived in *daboitas* made of a combination of palm wood, leaves, cooked earth and metal sheet. Their main income source was trade of plaits made by women from *doum* (coffee) palm tree fibres. Villagers used to sell charcoal and bundles of fuel wood as part of a livelihood diversification strategy although the practice diminished due to the government prohibition decrees of 1919 and 1938 and the 1982 law regulating wood cutting (META 1999, p.8). Yet, households still used charcoal and bundles of fuel wood to cook and warm themselves at night. Those pastoralists who settled since 2000 mostly came from the Dakka Mountains shown in Figure 7.4 and/or the plains in the southern part of the region.

Respondents indicated suffering mostly from the incapacity to rebuild their herds and from the lack of regeneration of traditional pasturelands. According to them, transhumance herding progressively decreased both in distance covered and in quantity of livestock herded. At the turn of the 20$^{th}$ Century, households used to practice transhumance herding independently of each other. However, because of a reduction in livestock numbers, it became more effective for the community to organize themselves in small groups of shepherds that would herd the livestock of several households.

With regards to livestock health, respondents stated that the major problem was forage disappearance. As a result, pastoral households shared some of their WFP food rations with their animals. Animal health was not checked since there was no veterinary posted in Dikhil. The major symptoms noted were mostly diarrhoea for camels and shoats. According to herders, there were also cases of *faciolosis* and *ruminal paramphistomosis*[54] among their livestock. Most sick animals came from the Dakka plateau where they usually drank from the worm infested water point located near the pasture lands.

[54] *Fasciolosis* or liver rot is a helminth zoonotic disease caused by two trematodes known as Fasciola hepatica (the common liver fluke) and Fasciola gigantica which tend to damage liver tissue. *Ruminal paramphistomosis* or rumen fluke is caused by parasites found in ruminants which attach to the lining of the rumen. Affected animals may suffer from anorexia and severe diarrhoea among other symptoms.

**Figure 7.4 Cartography of pasture lands around Hanlé 2**




*Source: Hanlé 2 Group Participatory Cartography, 2013*

For those involved in farming, unsafe conditions could arise for those lacking adequate equipment to access underground water. A few pastoralists usually herded the livestock of several families while those that stayed in Hanlé 2 dedicated more time to household chores, agriculture and trade. As indicated in Table 7.1, the majority of households approached practised agro-pastoralism. The agricultural plots seen in Figure 7.5 were created about 35 years ago as an effort to diversify the community's livelihoods following the successive and long aridity periods which struck the area.

**Table 7.1 Households' livelihoods in Hanlé 2**

| Livelihood | Proportion | Main capital | Additional sources of livelihood |
|---|---|---|---|
| 1. Pastoral | 10 to 15% | Livestock | WFP food aid, pension, remittances, selling charcoal/bundles of fuel wood |
| 2. Agro-pastoral | 85 to 90% | Plot(s), well(s), manual pump(s), *chadouf*[55] or motor pump(s) | Commerce, WFP food aid, remittances, livestock selling |

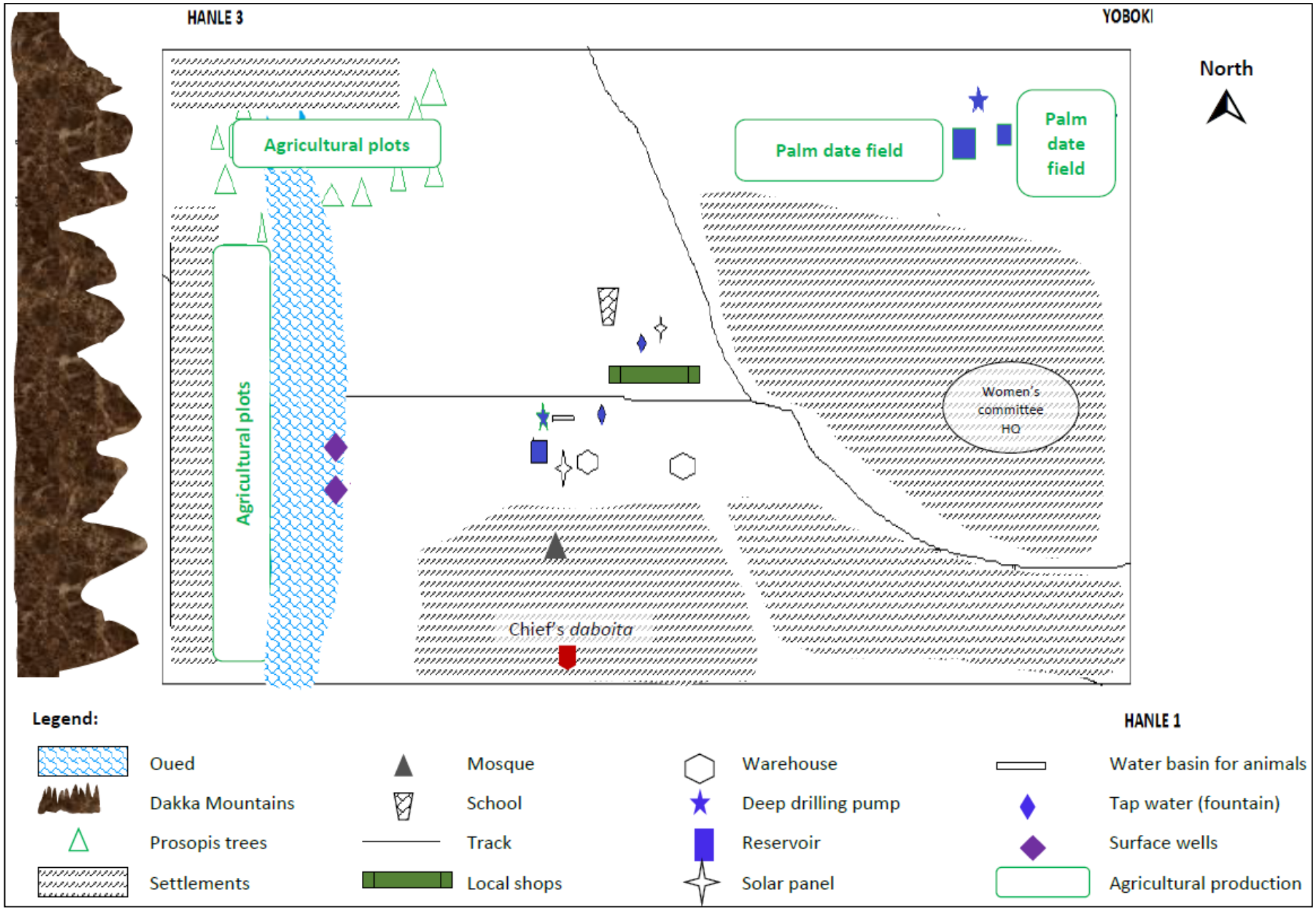
*Source: Author's research in collaboration with ACF*

Most households owned an agricultural parcel. The owning household planted and harvested its own plot for the family's subsistence and/or for the market. Since all agricultural plots relied on underground water for irrigation, a variety of vegetables were grown such as tomatoes, onions, green chili, carrots and cabbages. The seeds were usually found in Djibouti City.

As shown in Figure 7.5, in terms of the infrastructure, community members indicated that the village's water infrastructure was of quite good quality. It was completed by a private enterprise. There are two water points in the village with two taps for human consumption and two basins for animal consumption and other human needs. Despite there being several water taps, fieldwork revealed that only one was functioning.

[55] Made of two strong branches of wood tied to together and a piece of metal, the *chadouf* is a traditional manual pumping technology based on the principle of a pivot.

**Figure 7.5 Cartography of Hanlé 2 village**




*Source: Hanlé 2 Group Participatory Cartography, 2013*

There was also a reservoir which was regularly cleaned (once a month) and checked. Still, immense quantities of water were wasted by the community as taps were often left open which let water flow out continuously. Further, the pipes were in plastic and were not buried deep enough underground. If exposed to the extremely high summer temperatures, they could quickly deteriorate in quality, increasing the risk of rupture. In addition, the absence of a water evacuation system and the presence of leakages throughout the water network were responsible for the existence of pools of water mixed with animal faeces which could easily contaminate the water passing through the pipes.

As was the case throughout rural areas, water was extracted from underground with a water pump equipped with a solar panel since 2008. Before that, the water pump was driven by fuel which used to pose problems in times of high fuel prices on the market. The solar panel was looked over by a man paid by the State and in charge of turning in and off the machine. The solar panel had been working properly since its installation. However, local pastoralists were not trained to fix possible glitches and solar panel spare parts were unavailable in Djibouti. Local technical maintenance of the water infrastructure was non-existent. In the event of the machine breaking down, the community would send one of their members to inform the National Office for Water and Sanitation of Djibouti (ONEAD)'s district headquarters in Dikhil City[56]. This office had a team of only six agents supervised by a sector chief for the entire region of Dikhil (MID 2009, p.12). It also had only one vehicle and was constrained by administrative procedures dictated by ONEAD headquarters located in Djibouti City. Their scope for intervention was thus extremely limited. After a certain period of time (from one to six months), the State agency would eventually send a technician to fix the problem.

On the social side, there was a strong traditional hierarchical order with a village chief, a village deputy chief and an assembly of aged-wise men. As shown in Table 7.2, a variety of community groups existed such as the agricultural cooperative of Hanlé 2, the palm date association, the women's committee and the parents' association with each counting various community members. The most influential group was the HADAF cooperative since it had the highest number of members. Anybody was authorized to join the cooperative and obtain a piece of land for

[56] Such a trip takes two hours roundtrip which is equivalent to two/three days on foot.

cultivation. However, in order to receive some minimal equipment from the cooperative, newcomers first needed to prove their worthiness to the association by initially growing crops without any help from fellow members.

**Table 7.2: Social structures in Hanlé 2**

| Community groups (in order of influence) | Main activities | Goods, capital and resources | Number of members |
|---|---|---|---|
| 1. Agricultural cooperative of Hanlé 2 (Hadaf) | Agriculture, fund-raising | Legumes, fruits, financial capital, plots, water pumps | 11 permanent members and 110 adherents |
| 2. Date palm cooperative | Date palm cultivation | Date palm production, water pump (lack of fuel), unused reservoir | 42 families |
| 3. Women committee | Mutual fund management and fund-raising | Financial capital | 9 permanent members and 40 adherents |
| 4. Parents' association | Education, school attendance follow-up, intermediaries between the community and external education partners | No financial capital and no resources | 8 members (parents) composed of 5 men and 3 women |

*Source: Author's research in collaboration with ACF*

There was one school built in cement with a director and four teachers. The exact number of pupils was not known (about 120). There was no water point within the school. Regular feeding of the children was ensured by the World Food Programme (WFP) which supplied the school's canteen for their breakfast and lunch. This regular feeding of registered children constituted a strong incentive for households to settle, stay in the village and send their children to school to study. There was network coverage in the village which allowed phone owners to communicate between themselves and to call relatives in the city. Still, the overwhelming majority of households did not have any phone and there was no rural phone[57] available in Hanlé 2.

In the health sector, despite the proximity of a health centre in Yoboki, the great majority of the population in Hanlé 2 and the rest of the sub-prefecture who had the means to do so preferred to

[57] A rural phone is a phone usually provided by the State (at a preferential cost) to a rural village to allow rural households to communicate in case of an emergency.

go to the 'Centre Médico-Hospitalier' (CMH)[58] of Dikhil City (40 km away) to seek proper treatment for free. However, the CMH was severely understaffed and lacked crucial equipment.

**Table 7.3: Health data in Hanlé 2**

| Main diseases | When? | Who? | Measures taken |
|---|---|---|---|
| 1. Diarrhoea | Cool season (October to April) | Children and adults if lack of hygiene | Evacuation to Yoboki's health centre |
| 2. Seasonal flu | Cool season, strong winds and seasonal transitions | Any group of the population | *Haba soda* (treatment by black cumin) |
| 3. Dermic mycosis | Unknown | Under five-year old | None |
| 4. Bronchitis/pneumonia | Cool season, windy days | Children | Evacuation to health centre (Yoboki or Dikhil) |

*Source: Author's research in collaboration with ACF*

The villagers themselves made their own stretchers to carry the sick and wounded to the main road to be transported to Dikhil City. According to respondents, a few years ago, health agents would sometimes come inspect the village as part of their regular rounds in the region but these have ceased because of lack of personnel. As shown in Table 7.3, the most common diseases and health symptoms cited were diarrhoea, seasonal flu, pneumonia and mycosis but eye diseases, fever and dengue were also problematic. These were mostly contracted during the cool *xays/dadaac* (October to February) and *diraac/sougoum* rains (March to April).

### 7.3.2 Second case-study: Koutabouya village

About 20 km away from As-Eyla village, Koutabouya's topography alternated between sandy plains bordering the *oued* of Gobaad and sandy clay towards Abbé Lake to the West. Similarly to Hanlé 2, the plain was covered by sparsely distributed shrubby steppes and lacked rocks and stones. The school represented the gravitational point of the village as the settlements surrounded it in a six kilometre-radius.

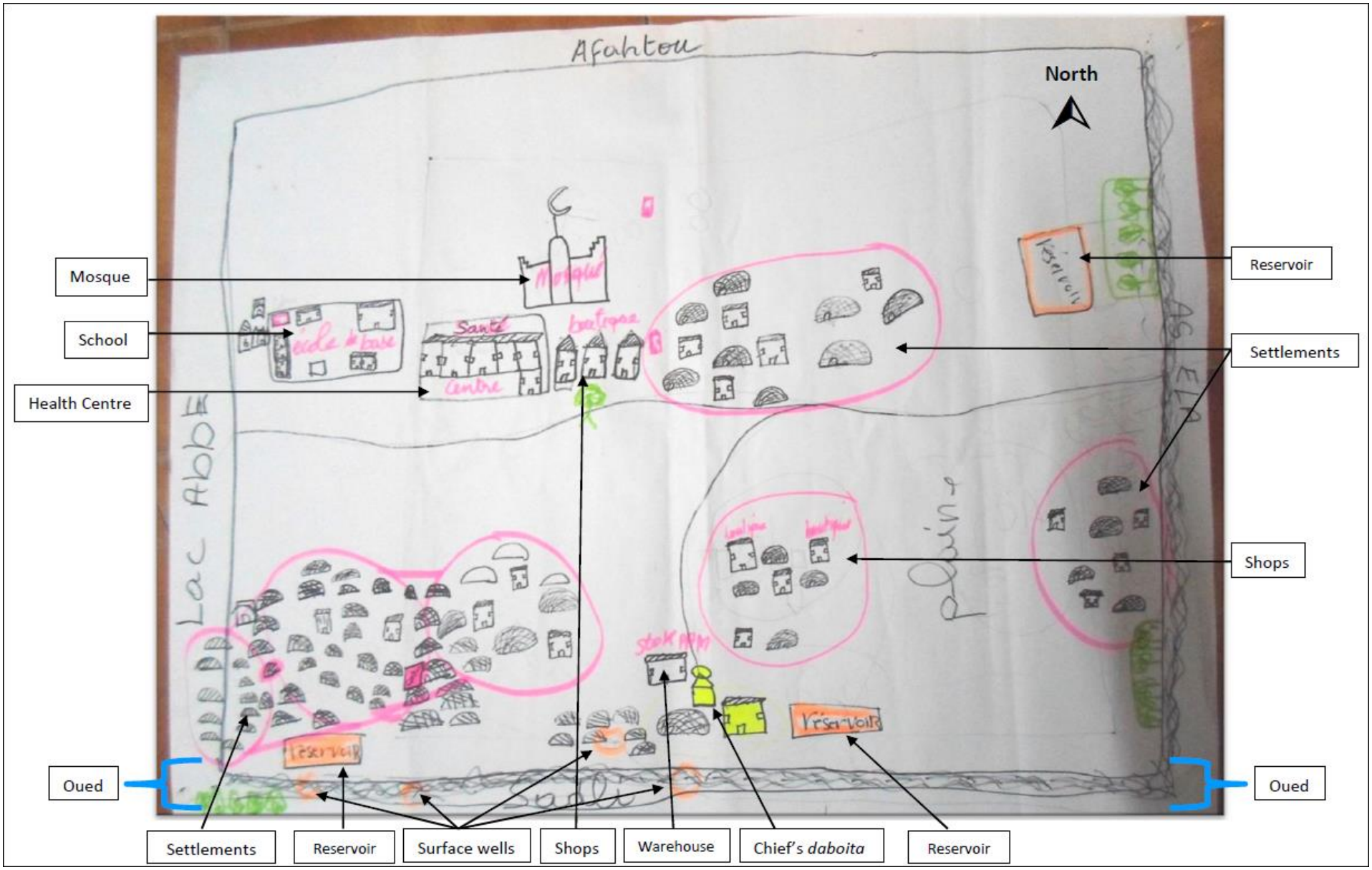
[58] The CMH was built in 2006 by the State and started functioning in 2008.

According to the village chief, there were about 2 700 inhabitants (about 500 households) living in Koutabouya which is more than the 400 households reported by the WFP. As seen later in the humanitarian assistance section of Chapter Eight, the difference in numbers had important implications on household food insecurity. Still very much influenced by Afar traditional rules, the village chief was chosen for his age and wisdom. The deputy chief, chosen by the village chief himself, was also president of the Parents' association and in charge of ensuring respect of indigenous rules and settling any potential disputes. The elderly, endowed with wisdom and authority, were also present and had a strong role within the community. Two Women's associations were reported, namely the Dafeyn Women Association (50 members) and the Koutabouya Women Association (50 members). Each association had its own lot of contributions to help community members when needed. Among the villagers interviewed for this research, the deputy Director of the school was the only one who could speak and understand French. As in Hanlé 2, only a handful of Afars could speak Somali.

As a result of growing environmental pressures, the settlement gradually expanded close to the school and the *oued* of Gobaad shown in Figure 7.6. The majority of dwellings were *daboitas* made of wood and block work. There were no houses made of stone or metal sheet. Most households practised semi-sedentary pastoralism (transhumance) although this tendency was decreasing and an increasing number of pastoral groups in the region were settling in the village. Contrary to Hanlé 2, no agriculture was practised and livelihood profiles were mainly pastoral in nature. According to respondents, the drought of the last four/five years was responsible for the gradual disappearance of pasture lands and the death of small livestock. During fieldwork in 2013, men would leave together with their livestock during the day and spent from a few days to several weeks in the wild while the rest of the family stayed in Koutabouya.

Although this was the village with the most significant number of livestock, pastoralists reported unusually high losses over the past decade due to the grave effects of drought. One of the problems faced by local communities was that the herders' needed to cover greater distances than before to find enough pasture lands for their herds. One of the highly prized grazing areas were the Abbé Lake's pasture lands four-five kilometres away from the village. Indeed, fieldwork confirmed the presence of several herds of sheep, goats and camels grazing in the area.

**Figure 7.6 Cartography of Koutabouya village**




*Source: Koutabouya Group Participatory Cartography, 2013*

Koutabouya herders, as in Hanlé 2, reported significant incidents of *faciolosis* and other diseases among their livestock. Officially, animal health was ensured by veterinary services present in As-Eyla. In reality, respondents and the veterinarian part of the investigative team indicated that there was no medicine nor any trained veterinarian posted there.

Another livelihood source was the trade of plaits and handicrafts but the lack of permanent water sources did not permit any agriculture in this village. A majority of households depended on monthly distributions of food aid by WFP, remittances from household members working in the city and livestock marketing at Dikhil city's market. Inhabitants from the surrounding area would also regularly come to Koutabouya to receive part of the WFP's food. The energy sources found in the village were charcoal, wood, batteries bought on the market and the school's solar panel.

In terms of the infrastructure, the Djiboutian Agency for Social Development (ADDS) built 5 cemented wells and 5 reservoirs in the *oued* and on its banks, respectively, in 2008. Each well was equipped with its own tap water and water basin for human and animal consumption. Ethnographic work revealed that four out of five wells were filled in and/or are unusable and water cannot be extracted from the one remaining since the village's sole motor pump was out of service. No motor pumps were provided to the villagers. One was later acquired through another development programme.

The villagers organized themselves to buy the fuel necessary to make it work but they did not know how to repair it and lacked the necessary spare parts on site. In addition, the reservoir needed further engineering work and rehabilitation and, as in Hanlé 2, some plastic pipes were uncovered which meant that they may deteriorate in the sun and eventually leak. Despite these observations, no one reported any leakages between the reservoir and the distribution point. As in Hanlé 2, they were dependent on ONEAD's help for technical maintenance and repair. Meanwhile, households relied on small quantities of water obtained from surface wells dug in the *oued* of Gobaad for human consumption. Since these manual wells were uncovered and unprotected, Koutabouya pastoralists were dangerously exposed to water-borne diseases. As the amount of water extracted from surface wells was insufficient for animal consumption, livestock were water-fed in the wild.

In the health sector, there was one health centre which lacked medicine and usually opened for women giving birth. As shown in Table 7.4, the main diseases and symptoms reported were fever, cold and diarrhoea. As in Hanlé 2, those in need of serious treatment preferred to go to the CMH in Dikhil city if they had the means to do so even though Dikhil's hospital was severely underfunded and lacked basic services such as continuous water access and enough beds.

**Table 7.4: Health data in Koutabouya**

| Main diseases | When? | Who? | Measures |
|---|---|---|---|
| 1. Diarrhoea | Rainy seasons | Children and pregnant women | Traditional drink mixture of salt and sugar |
| 2. Bronchitis | Cool season | All age/gender groups | Medical treatment at Dikhil's CMH |
| 3. Dermatitis (*adlaké*) | Continuously (lack of hygiene) | All age/gender groups | None because of lack of local herbs |

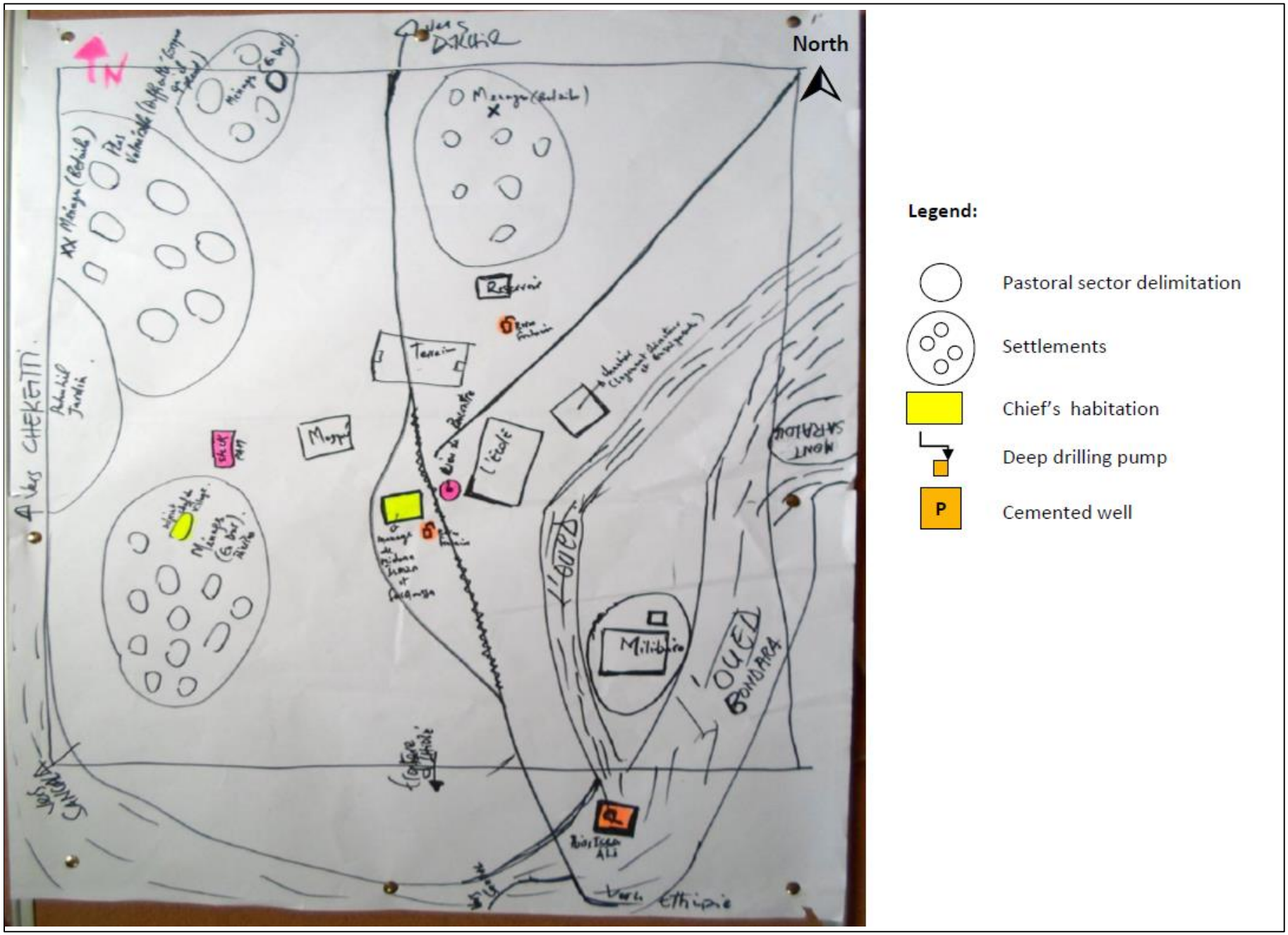
*Source: Author's research in collaboration with ACF*

In the education sector, there was one school, one director, one deputy director, three teachers and two maintenance personnel. Built in 2002, the school welcomed approximately 150 pupils. As in Hanlé 2, there was a canteen regularly supplied by WFP where daily lunch was provided. In 2009, the school benefitted from rehabilitation works and the installation of a solar panel funded by the American army. The school had a reservoir but its construction was not solid and the interior was dusty, stony and dirty. There was a water point within the school but there were no taps to distribute the water. As a result, the school personnel and pupils accessed the water through a hosepipe connected to the reservoir. Further, there were three latrines rarely used due to the lack of water. Apart from irregular interventions by the USAID and the UNICEF through donation of equipment such as tables and chairs, the WFP was the only external organization regularly intervening in the village through its food assistance programme.

### 7.3.3 Third case-study: Bondora village

Figure 7.7 shows that Bondora, as in Koutabouya and Hanlé 2, was located near an *oued* which explains the sandy soil observed in the southern extremity of the village. Since the environment was very rocky, pastoralists built their *toukouls* from a mixture of earth and stone. Although these seemed solid and protective, respondents reported suffering from strong winds causing respiratory diseases/symptoms, especially during the *jilal* (cool) season from October to April.

**Figure 7.7 Cartography of Bondora village**




*Source: Bondora Group Participatory Cartography, 2013*

Situated less than a kilometre away from the southern Djiboutian-Ethiopian border, Bondora was the last village before reaching the frontier. The settlements were on the footpath linking Djibouti to Dire-Dawa in Ethiopia. The population was estimated to be around 1200 inhabitants (about 240 households). According to the inhabitants, the first houses were erected in the 1970s. In the 1990s the population grew dramatically due to a severe drought which hit the region, killing off entire herds. The hazard erased the livelihood basis of 90% of those currently settled in Bondora. The village was characterized by a firmly settled population, apart from caravan merchants and travellers who occasionally walked through the village. Headed by both a village chief and a deputy village chief, it was connected to Dikhil by a non-cemented rocky track.

**Table 7.5 Social structures in Bondora**

| Community groups | Main activities | Goods, capital and resources | Number of members |
|---|---|---|---|
| 1. Women's committee | Financial assistance in case of 'dystocia' and pregnancy-related issues | Financial capital[59] | 8 permanent members and 30 adherents |
| 2. Parents' committee | School attendance follow-up[60] | None reported | 11 members at the start, only 6 remaining today |
| 3. Sanitation /environment protection association | Meetings, sensitization and fight against deforestation | None reported | 7 members |

*Source: Author's research in collaboration with ACF*

The village had a mosque built by an Arab non-governmental agency (NGO), a school feeding centre supported by the WFP and a military outpost. Table 7.5 shows that the Women's committee, the Parents' committee and the Environment protection association were the three main community groups.

Bondora (along with Sankal) stood out among the study sites because of the extreme lack of any form of sustainable livelihood. Figure 7.8 shows that the pastoral households living in Bondora used to graze their animals in the surrounding area, namely the Camadaleh plains, Orgi Dabal, Arey plateau, Ougoul plateau, and Bakaré.

[59] 100 DJF/month/person was regularly collected as contributions to the association's funds.
[60] The committee had not been operational since the start of the 2012-2013 school year following a disagreement between its members and the school director.

**Figure 7.8 Cartography of pasture lands around Bondora**


*Source: Bondora Group Participatory Cartography, 2013*

However, the quantity and quality of forage accessible in these pasture lands severely diminished which forced those few remaining herders to cross the Ethiopian border to the South to graze what little was left of their animals. Some household members still practised some transhumance but at a decreasing rate since most (if not all) of their livestock were lost, with two to three goats remaining per household on average. About 80% of households heavily relied on collecting and selling bundles of fuel wood from Dourdour and Sankal, half a day away from Bondora on foot. Contrary to Hanlé 2, the inhabitants, still deeply pastoral, untrained and deprived of equipment, did not practise any agriculture. Other reasons included insufficient water access and the extremely rocky type of environment which would require hard work to clear for cultivation. There was no remunerated work available within the village hence household members needed to go to Dikhil City or Djibouti City to find paid jobs.

The water infrastructure was highly problematic. Although it had a solid covered cemented well in the *oued* shown in Figure 7.7 and good network connections between the water taps, the reservoir and the deep drilling pump located a few miles away from the settlement, the system did not work properly. Firstly, the water taps were broken which meant that when water passed through the pipes, large quantities of water were wasted. Secondly, the connections were getting old and therefore several leaks were reported. Thirdly, the deep drilling pump was activated for only a few hours a day which was not enough time to allow the reservoir to fill up and to offer enough water for households' daily needs. According to villagers, the State agent in charge of regulating the use of the borehole told them that limited activity of the pump intended to minimize chances of it breaking down and to preserve the underground water's quantity and quality. Fourthly, the good quality cemented well was built in the *oued* and its water was not consumed because it had been contaminated during the last flash-floods of 2010. As a result of these factors, households were forced to manually dig surface wells in the *oued* which, as in Koutabouya, exposed the consumers to water-borne diseases. Others opted for strenuous two-hour walks to fetch water from more remote locations.

In the health sector, before settling in these villages, pastoralists reported that they used to rely on medicinal herbs for treatment. However, because of the disappearance of vegetative cover inland, Table 7.6 shows that they suffered from opportunistic diseases such as diarrhoea, bronchitis and

conjunctivitis. Traditional healing based on herbs was rarely used and when possible, the sick were sent to the CMH in Dikhil by car or on a donkey's back.

**Table 7.6: Health data in Bondora**

| Main diseases | When? | Who? | Measures |
|---|---|---|---|
| 1. Diarrhoea | Rainy seasons | Children and pregnant women | Drink mixture of salt and sugar |
| 2. Bronchitis | Cool season | All age/gender groups | Medical treatment at Dikhil's CMH |
| 3. Dermatitis (*adlaké*) | Continuously (lack of hygiene) | All age/gender groups | Traditional healing with 'jujubier' |
| 4. Conjunctivitis | Rainy seasons | All age/gender groups | Application of salty water |

*Source: Author's research in collaboration with ACF*

### 7.3.4 Fourth case-study: Dadahalou village

Dadahalou village was exclusively inhabited by Somali-Ise and was located about five kilometres away from Mouloud. Mouloud's position on the transit route from Ethiopia to Djibouti City made it a favourable place to market all kinds of products such as milk and goat butter. As a result, Dadahalou villagers were often seen making trips to Mouloud to buy foodstuffs and non-food items. As in Bondora, it was headed by both a village chief and a deputy village chief and was exclusively constituted of pastoral households (about 400 individuals or 85 households) who had gradually settled following the drought which hit the region five years ago. Similarly to other study sites, respondents from Dadahalou reported that as nomadic pastoralists, their displacements in *badia* were guided by scouts who would regularly identify zones with enough water and pasture from season to season. However, environmental pressures were so great that they had to settle to access water from wells and the WFP's food rations. Dadahalou had more livestock than Bondora as its inhabitants settled more recently than those in Bondora. The number of animals were estimated by the villagers at about 2500-3000 shoats, 400-500 cows, 80-60 camels and 50 donkeys. On average, a household's flock was composed of between 30 and 40 shoats.

Dadahalou's livelihoods were mainly based on livestock rearing. The particularity of Dadahalou was that its livestock were under threat from an unidentified disease provoking unusual abortions

exclusively among shoats. According to the respondents, the disease appeared in 2012, with animals firstly exhibiting respiratory symptoms such as dyspnoea and coughing. Goats and sheep would die by the tens every day. By 2013, it was reported that shoats still experienced unusually high rates of abortions at any stage of pregnancy despite the fact that the respiratory symptoms had now disappeared and the animals managed to recover from the disease on their own. According to a veterinary colleague who assessed the severity of this disease, international norms specify that a veterinarian must be contacted if three percent of a herd suffered from unusual abortions. In this case, from 50 to 60% of producing goats were affected. Herders had lost from 30% to 40% of their livestock since the aging generations were not replaced. Further, 90% of livestock were affected by tick-related disorders. Since veterinary services were non-existent in Dikhil city, Dadahalou's pastoralists often expressed feelings of helplessness. Given the combined effects of drought and disease, respondents indicated that pastoral livelihoods in the village were gradually disappearing.

Dadahalou village had a huge unprotected well, a reservoir and a water basin for animal consumption built by the government close to the school and the settlement. The well was so big that it was not possible to cover it. It also suffered from lack of maintenance. As a result, anything (e.g. dust, stones, and animal faeces) would fall inside and contaminate the water. Further, the underground water-table had been steadily decreasing. At the time of data collection, the water level in the well was too low to satisfy the community's needs. Therefore, households needed to dedicate between one hour and half and three hours to fetch water away from the settlement. In terms of non-water related infrastructures, Dadahalou only had a school recently built by the government. As in Bondora, Dadahalou did not have any real functioning health centre, or any local shops. Apart from irregular interventions by the Non-governmental Organization (NGO) Johaniter through screening for acute malnutrition and the administration of nutritional complements to those suffering from severe acute malnutrition in Bondora and Dadahalou, the WFP was again the only visible external actor intervening in the village through monthly distributions of food.

### 7.3.5 Summary of case-studies results

Table 7.7 summarizes the specific hazardous conditions previously reviewed in each village.

**Table 7.7 Summary of unsafe conditions in study sites**

| Study Sites | Installations, infrastructures and livelihoods | How unsafe? | | | State conditions | Consequences on Pastoralists |
|---|---|---|---|---|---|---|
| | | High | Moderate | Low | | |
| **Hanlé 2** | School | | X | | Well-built/Location often experiences violent winds/lacks equipment/no running water | Roofs tore down by winds/Dust infiltrates in classes and latrines leading to health risks/Progressive increase in community's literacy rate/High dependence on WFP assistance |
| | Water facilities | | X | | Irrigation wells and surface wells often buried by dust and sandy winds/no cover/Good location right above big inféro-flux underground water | Surface wells often destroyed/lower access and availability of water for human consumption/irrigation well contamination by dusts, insects leading to health risks |
| | Pasture lands | X | | | Lack of rainfall decreases forage quantities /Hyperventilated area/Overgrazed/Unprotected young plants/Excessive presence of *Prosopis* | Shrinking pasture lands/desertification/no regeneration of forage plants for livestock/pastoral livelihoods indirectly affected |
| | Agricultural plots | | X | | Very fertile soil/Growing salinization of underground water table/ Unknown quantity levels of underground water | Good production levels/Decreasing soil fertility over time/Potential water crisis/Livelihood diversification process at risk |
| | Livestock | X | | | Diseased shoats and camels from *faciolosis* /lack of water and shrinking pasture lands lead to malnutrition | Decreased value of livestock/High mortality/Difficult regeneration of herds/pastoral livelihoods reduced/High dependence on WFP's food rations |
| **Koutabouya** | Health Centre | X | | | No medicines/no infirmary services/no beds/no water | Unusable facilities/health risk because of great distance (several days march) to nearest health center |
| | School | | | X | Well-built/Presence of functioning water point within the school/Supplied Canteen/Trained Personnel | Good learning conditions/Progressive increase in community's literacy rate/Moderately dependent on WFP assistance |
| | Water facilities | X | | | Unprotected cemented well/Uncovered surface wells | Risk of cemented well collapsing on itself/Risk of contamination from surface wells/Decreasing access and availability of water due to aridity |
| | Pasture lands | | X | | Lack of rainfall diminishes forage levels/No use of the *mise en défend* regulations/Overgrazing | Shrinking pasture lands/desertification/no regeneration of forage plants |

| Study Sites | Installations, infrastructures and livelihoods | How unsafe? | | | State conditions | Consequences on Pastoralists |
|---|---|---|---|---|---|---|
| | | High | Moderate | Low | | |
| | Livestock | | X | | Important quantities of livestock/Close to Lac Abbé and Ethiopian border's pasture lands/*Faciolosis* cases reported | Endangered pastoral livelihoods/Fragile physical, social and natural basis/High dependence on WFP's food rations |
| **Bondora** | School | | | X | Recently rehabilitated/Solar panel/good equipment/supplied canteen/no running water | Good learning conditions but lack of hygiene /Progressive increase in community's literacy rate/100% dependent on WFP assistance |
| | Water facilities | | X | | Untreated water in protected cemented well located in the *oued*/Uncovered surface wells | Risk of contamination from surface wells/Decreasing access and availability of water due to aridity/Households forced to fetch water one-two hours away |
| | Pasture lands | X | | | Low rainfall for past seven years /overgrazed | Pasture lands nearly completely disappeared/livestock forage compromised |
| | Livestock | X | | | Insignificant levels of livestock (no more than 30 shoats or five camels by household) | Pastoral livelihoods non-viable/100% dependence on WFP's food assistance |
| **Dadahalou** | School | | X | | Well-built facility/well-equipped/lack of electricity/supplied canteen/no running water | Good learning conditions but lack of hygiene /Progressive increase in community's literacy rate/Highly dependent on WFP assistance |
| | Water facilities | X | | | Huge unprotected and uncovered well/motor pump of a particular used to extract the water/Water depth a few inches | Lack of water for human consumption/Other water sources exploited two hours away from settlement |
| | Pasture lands | X | | | Low rainfall for past four-five years /shrinking pasture lands | Greater distances covered by livestock for pasture and water/aridity is compromising livestock forage availability |
| | Livestock | | X | | Non-negligible amount of livestock reared/30-40% shoats and camels suffer from abortions/90% affected by ticks | Livestock at risk of dying out/fragile pastoral livelihoods |

*Source: PVCAs in Hanlé 2, Koutabouya, Bondora and Dadahalou*

**Table 7.7 continued**

It demonstrates that settled pastoralists experienced conditions of living characterized by unhygienic water infrastructure and total lack of healthcare services. There was evidence of lack of sufficient infrastructure and equipment for the delivery of social services in the health, education and water sectors. In addition, respondents from all villages reported receding pasture land cover and diminished access to safe water. Unsafe conditions also included the fragility of pastoral livelihoods which has forced rural households to diversify their sources of income and food. These unsafe conditions are immediate factors of human vulnerability through their effects on human health, animal survival and gradual livelihood loss. In the following chapter, the ways in which vulnerability is expressed by living in these unsafe conditions are discussed.

## 7.4 Conclusion

The overall aim of the chapter was to explain the role of root causes and the resulting effects of local dynamic pressures in the production of unsafe conditions. It showed that the colonial administration first *encouraged* the sedentarization of rural pastoralists to control nomadic movements over the land.

Natural checks on livestock rearing were affected by the appearance of the railway and market centres, the construction of boreholes and the availability of veterinary services. At first animals multiplied in restricted locales and herds increased in size. However, the after-effects on ecosystem services, the non-rehabilitation of water points and the disappearance of veterinary services especially in the last ten to fifteen years adversely affected livestock populations and pastoral livelihoods.

Following this first wave of settlement during the colonial period, the sedentarization process was reinforced by the increased attractiveness of urban centres in the second half of the 20$^{th}$ century and the growing scarcity of pasture and water for an unsustainable number of animals. The second sedentarization wave which happened in the last fifty years was provoked by declining livelihoods, shrinking pasture lands and the need for pastoralists to diversify their livelihood base. As a result, villages where food assistance and school education were offered grew in attractiveness.

The non-rehabilitation of water points, the absence of environmental initiatives aimed at preserving pasture lands and progressive abandonment of traditional rules of *mise en défens* led to the progressive appearance of unsafe conditions. The hazardous locations of living included the lack of potable water facilities, diminishing underground water levels, increased reliance on uncovered surface wells and/or increased distances covered by women and children to fetch water, increased dependence on food aid assistance, unfair terms of trade on the market for selling livestock and diminishing livestock numbers in the face of 'normal' droughts and/or dry periods.

# 8 Livelihood change: linking unsafe conditions and human vulnerability

## 8.1 Introduction

Following on from Chapter Seven, this chapter uncovers the relationship between livelihood change and the sedentarization process and their resulting impacts on human vulnerability to drought and households' adaptive capacity. Globally, the chapter investigates the hypothesis that livelihood change and sedentarization is associated with improvements in human vulnerability and food security status.

The chapter first discusses the impacts of sedentism on health which stem from changes from a nomadic to a sedentary way of life. Secondly, given the connections that exist between disease and nutrition status, the chapter also examines nutritional changes associated with livelihood change. Additionally, the chapter covers the progressive changes in the re-allocation of roles within the households linked to both livestock structure changes and the emergence of a novel, more diversified livelihood base. Lastly, the chapter reviews the array of adaptive strategies used by rural households from the study sites in their management of food insecurity. This analysis includes the nature and impact of external interventions from the State and humanitarian organisations in addressing food insecurity in the villages of interest.

## 8.2 Sedentism and health impacts

According to the literature, nomadic pastoral communities of Africa (including the Somali and Afar pastoralists) frequently suffer from diarrhoea, acute respiratory infection and malaria (Seaman et al. 1973, Schelling et al. 2005, Fratkin et al. 2006). My fieldwork also found that respondents from the study sites frequently suffered from cough, eye infection, chicken pox ("buttons on the body") and chest pain when they were nomadic. This tallies with data from studies

with the Turkana (Barkey et al. 2001). Interviewees from Koutabouya and Dadahalou also indicated suffering from additional health risks associated with livestock keeping which included high rates of trachoma through flies attracted by livestock, brucellosis and tuberculosis acquired through milk consumption and leishmaniasis contracted through sand fly bites. These three health impacts were also found in studies by Sheik-Mohamed and Velema (1999), Chabasse et al. (1982) and Barkey et al. (2001), and Fratkin (2006), respectively. Other sources of health contamination reported by respondents included unsafe water points which were breeding grounds for guinea worms. This finding was also mentioned by Sheik-Mohamed and Velema (1999).

Despite the diseases mentioned above, the mobility of nomadic pastoralists reduced pathogen propagation within the community and therefore diminished exposure to measles, cholera, and helminthic infections through contact with faecal material as they left their waste behind when they moved (Chabasse et al. 1982, Sheik-Mohamed et al. 1999, Schelling et al. 2005, Fratkin et al. 2006). On the other hand, a nomadic pastoral way of life meant that Afar and Somali-Ise households tended to live far away from health clinics, medicine and orthodox clinical treatments and tended to not consider visiting a dispensary because of the distance or cultural and/or traditional reasons. This was unfortunate since the CMH in Dikhil City did not charge nomads for treatment although the services offered were minimal. Further, if they did come to the health clinic and were not discriminated against, they tended to arrive with advanced stages of the disease (Schelling et al. 2005) and treatment compliance was reported to be generally poor (Sheik-Mohamed et al. 1999). Hence, nomads used other treatment methods. In Sankal for instance, pastoralists resorted to a variety of means for treatment:

> "I would make a mixture of *badhi*[61] and plants. Then I cooked it and I kept the evaporated solution to give it to the child. "*(SI21, 2012)*

> "We used to heal our animals and use plants/trees and cook butter to heal ourselves. " *(SI29, 2012)*

> "When they would fall sick, we would use the animals to treat them or we would bring them to some doctor. Now, if they fall sick, we wait for some doctor to come. "*(SI39, 2012)*

[61] This Somali term designates the sheep's tail which was known to be rich in fats.

"We would take the children to the hospital on foot or use an ambulance. We would also use some medicinal plants." *(SI40, 2012)*

"We would bring medicine from hospitals. Sometimes, we would use medicinal plants and animal-derived solutions." *(SI42, 2012)*

"We would cut the goat and administer milk. There was no hospital. If there were medicinal plants, we would use it. Otherwise, we would just leave things the way they were." *(SI46, 2012)*

As seen here, respondents stated a variety of combinations of the following elements: use of medicinal plants, animal parts (sheep's tail, milk, *subak* (butter) and conventional medicine). Some said they sometimes administered no medical treatment whatsoever, hoping the children's immune system would fight off the infective host(s) and/or symptoms they would be suffering from.

**Table 8.1 Hazard ranking in Koutabouya and Dadahalou**

| Hazard Ranking | Koutabouya | Dadahalou |
|---|---|---|
| **1** | **Drought** | **Drought** |
| 2 | Cold | Cold |
| 3 | Human diseases | Human diseases |
| 4 | Animal diseases | Animal disease |
| 5 | Ticks | Violent winds |
| 6 | Wild animals | Ticks |
| 7 | Floods | Wild animals |

*Source: Author's research in collaboration with ACF*

Various hazards affecting both human and animal morbidity/mortality were reported in Hanlé 2, Koutabouya, Bondora and Dadahalou. Since livelihood profiles (livestock herding (transhumance) around the settlements) found both in Koutabouya and Dadahalou were quite similar, the villagers reported similar hazard ranking (see Table 8.1). As expected, drought was the most problematic hazard followed by low temperatures and human/animal disease outbreaks.

Further details on these health hazards were uncovered using another participatory tool – the seasonal calendar – which yielded information on the seasonal occurrence of hazards and their impacts both on livelihoods and individuals. The calendar was drawn on a flip chart before the activity. After having explained the purpose of the exercise to group members, the investigative

team, under the supervision of the present author, started by asking the community members about the occurrence of rainy and yearly seasons. Then, the participants listed a number of hazards which were then added to the seasonal calendar. Through the exercise, a lot of discussion arose concerning the degree of severity of each hazard since its impacts on people differed from one household to the next. In Hanlé 2, there was so much discussion that the seasonal calendar ended up being drawn in the sand since it was often changed. Further, it is specified here that human disease is not considered a hazard per se. Rather, it is the product of the action of a pathogen (virus, bacterium, environmental variable like cold temperature or high humidity levels) on a susceptible host: the human organism. However, for the sake of clarity in the context of this participatory evaluation of vulnerability and risks, human (including animal) disease was viewed as a hazard. The exercise permitted the community to analyse the temporal variability of hazard impacts which yielded useful results for this research.

Table 8.2 shows that most hazards have their highest impact during the *jilal*, also known as the dry season, from November to February. Fieldwork in the four villages was carried out from March to July 2013, a year after the 2010-2012 Horn of Africa drought. According to respondents, herders needed at least three years of normal seasonal rainfall to rebuild their herds. As expected, the aridity row in Table 8.2 shows that lack of rainfall is problematic throughout the year in Hanlé 2, Bondora and Dadahalou. Interestingly, Koutabouya households indicated suffering from aridity impacts from November to February only. It is suggested that since Koutabouya village is the study site closest to the Abbé Lake's pasturage and to the refugee pasture lands of Ethiopia to the West, herders had an easier time finding sufficient forage of acceptable quality content for their animals. On the other hand, Bondora and Dadahalou households were further away from these profitable lands and needed to migrate to the South where pasture lands were not as plentiful.

Cold weather had a significant impact on individuals from October to March (*jilal* cool season) which may be related to their decreased dietary intake compared to a few decades ago when households used to be better nourished. This would also account for greater human morbidity during this period as well.

**Table 8.2 Integrated seasonal calendar**

| Hazards | Study Sites | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aridity | Hanlé 2 | xxx | xxx | x | x | x | xx | xx | xx | x | x | xx | xxx |
| | Koutabouya | xxx | xxx | | | | | | | | | xxx | xxx |
| | Bondora | xxx | xxx | x | x | x | x | x | x | x | x | xx | xx |
| | Dadahalou | x | x | x | x | xx | xx | xx | xx | x | x | x | x |
| Cold | Hanlé 2 | xxx | xxx | | | | | | | | | | xxx |
| | Koutabouya | xxx | xxx | | | | | | | | | xxx | xxx |
| | Bondora | xxx | xxx | | | | | | | | x | xx | xx |
| | Dadahalou | xxx | xxx | xx | | | | | | xx | xxx | xxx | xxx |
| Human diseases (Fever, diarrhoea, bronchitis) | Hanlé 2 | xxx | xxx | x | | xx | | | | xx | | xx | xxx |
| | Koutabouya | xx | | | | xx | | | | | | xx | |
| | Bondora | xxx | xxx | | | | | | | | | xxx | xxx |
| | Dadahalou | xx | xx | xx | xx | | | | | | xx | xx | xx |
| Animal diseases (pneumonia, bronchitis) | Hanlé 2 | xx | xx | | | x | xx | xx | x | | | | |
| | Koutabouya | | xx | xx | | | | | | | | | |
| | Bondora | xx | xx | | | | | | | | | xx | xx |
| | Dadahalou | xx | xx | | | | | | | | xx | xx | xx |
| Violent winds | Hanlé 2 | | | | | x | x | x | | | | | |
| | Koutabouya | | | | | | | | xx | xx | | | |
| | Bondora | | | | | | | | xx | xx | xx | | |
| | Dadahalou | xxx | xxx | xx | | | | | | xx | xx | xxx | xxx |
| Ticks | Hanlé 2 | | | | | | | | | | | | |
| | Koutabouya | xx | xx | | | | | | | | xx | xx | xx |
| | Bondora | xx | xx | xx | | | | | | xx | x | x | x |
| | Dadahalou | x | x | | | | | | | | x | x | x |
| Wild animals (hyenas, wild dogs, coyotes) | Hanlé 2 | xx | xx | | | | | x | | | | | |
| | Koutabouya | | | | xx | xx | | | | | | | |
| | Bondora | xx | xx | | | | | | | | | xx | xx |
| | Dadahalou | x | x | x | x | x | x | x | x | x | x | x | x |
| Rainy seasons | | Inland dry season | | *Diraac/sougoum* | | | Dry Spell | *Karan/karma* | | | Inland dry season | | |
| Hunger/Lean season | | | | | | | | | | | | | |
| Yearly seasons | | *Jilal* | | Transition | | *Hagaa* | | | | Transition | | *Jilal* | |

*Source: Group discussions in Hanlé 2, Koutabouya, Bondora and Dadahalou, Sequence of rainy and hunger seasons from (FEWS-Net 2013b)*

x: low impact
xx: Moderate impact
xxx: High impact

Based on ethnographic work, informal discussions and Table 8.2, the rise in both human and animal diseases during the *jilal* is linked to seasonal changes in temperature and humidity variables. These changes influence the survival of certain insects, bacteria and vectors which tended to increase during the cool season and to decrease during the *hagaa* (hot season). For instance, Table 8.2 reveals that ticks were more of a problem during the *jilal* season. These blood-sucking insects were zoonotic (animal disease which can transmitted humans) vectors which could negatively impact the immune system of livestock and increase the risk of animal malnutrition.

In Chapter Seven, it was remarked that unsafe conditions of living included the high probability of contaminated water being consumed by villagers because of uncovered surface wells (Bondora and Koutabouya) and unprotected water infrastructure (Hanlé 2 and Dadahalou). It is suggested that the combination of these non-hygienic conditions, low temperature and high humidity levels could account for the higher proliferation of disease vectors during the *jilal* than during the *hagaa*. This risk was even higher during the seasonal transition periods when both temperature and humidity levels were known to change. This combination of factors could explain the surge in the number of cases of diarrhoea, dengue fever and pneumonia.

Concerning the incidence of animal disease, livestock faced additional challenges related to access to sufficient forage. Interestingly, a useful comparison can be made between the pattern of seasonal impact of animal disease and that of aridity. Table 8.2 shows that, similarly to aridity impacts, animal disease had a higher effect on livestock in Hanlé 2, Bondora and Dadahalou than in Koutabouya. This could be explained by Koutabouya's proximity and easier access to the Kalo refugee lands to the West which are farther from and less accessible by Dadahalou and Hanlé 2 herders. Yet, this suggestion must be considered with caution since higher impact from animal disease could be interpreted differently across villages depending on how valued the livestock affected were and the incidence and/or prevalence of the disease(s). For instance, as mentioned in Chapter Seven, the majority of Bondora households settled because of excessive animal losses while Koutabouya households still had a significant number of livestock to rely on. Yet, Bondora households indicated that their livelihoods suffered more from animal diseases than those in Koutabouya. Since a sick animal cannot be sold, consumed nor exchanged, it is suggested that the impact of disease on livestock was felt more in Bondora than in Koutabouya.

Violent winds did not represent a significant problem in the villages, except in Dadahalou. It is noticed that the impact from this hazard was felt more strongly during the *hagaa* (hot season) between May and September and coincided with the occurrence of the strong sandy winds of the *Khamsin*. Its occurrence across regions varied depending on various abiotic factors. These dusty winds can infiltrate *databoitas* and *toukouls* and represented a serious challenge for women and children in charge of fetching water over from remote locations. No significant trends were found in the incidence of animal attacks across villages.

Thus, significant correlations and associations were found between the occurrence of hazards and calendar seasons. Globally, except for violent winds, most hazards' impacts are felt across villages during the *jilal*. In addition, strong similarities were found in the pattern that hazards affected the different villages. However, no significant associations were found between specific hazards and the occurrence of the *diraac/sougoum* or *karan/karma* rainy seasons.

In addition to the seasonal calendar exercise, the hypothesis of a decreasing pattern in morbidity and mortality rates with the sedentarization of nomadic pastoralists was examined. It is assumed that by settling, pastoral communities have easier access to health infrastructure and should therefore exhibit less morbidity and mortality rates than pastoral nomadic communities. In order to assess this claim, a review of the literature from 1990 to 2011 comparing nomadic and sedentary populations' health status was made. The results summarized in Table 8.3 show that the majority of studies (six out of ten) found higher morbidity/mortality rates among sedentary communities compared to nomadic groups. According to these authors and most anthropologists, settling is associated with increased concentration of hosts in a restricted area which increases infectious and zoonotic diseases, including tuberculosis and colds, while nutritional levels may stay equivalent or decrease (Barkey et al. 2001). Although nomads' awareness about the water's bad quality before settling was debatable, respondents from the study sites knew that rural water points were contaminated which exposed them to water-borne diseases:

> "At midnight, we try to get water and we put it in the jericans until the early morning. Sometimes, we go the torturous way until Ethiopia. That water with this hot weather can cause sickness leading you to not being able to pee and to vomit and leading to diarrhoea. We used to move according to the seasons before. Only the tall people can go." *(SI28, 2012)*

**Table 8.3 Comparative table on morbidity rates between nomadic and sedentary communities in Africa**

| Study number | Date published | Pastoral communities | Group with higher morbidity levels | Citations | Sources |
|---|---|---|---|---|---|
| 1 | 2011 | The Rendille of Kenya | Sedentary | Sedentary populations had more self-reported days ill (fever, respiratory, and diarrhoea) than the nomadic community | Fratkin et al., 2011 |
| 2 | 1999 | The Ariaal and Rendille of Kenya | No significant difference | Non-significant differences among all communities with respect to morbidity data. | Fratkin et al., 1999 |
| 3 | 2006 | The Rendille and Ariaal of Kenya | Sedentary | Settled children had higher morbidity rates than pastoral children in respiratory and diarrheal diseases | Fratkin et al., 2006 |
| 4 | 2004 | The Fulani of Nigeria | Sedentary | Adults residing in Jos had systolic and diastolic blood pressures generally higher than those of rural Fulani; overall risk of cardiovascular disease among urban dwellers is greater than it is for semi-nomadic Fulani | Glew et al., 2004 |
| 5 | 2001 | The Turkana of Kenya | Sedentary | Settled Turkana men reported significantly more eye infection, chest infection, backache, and cough/cold than the nomads | Barkey et al., 2001 |
| 6 | 1999 | The Turkana of Kenya | Sedentary | Settled Turkana experienced reduced fertility, increased morbidity (particularly from malaria) and increased child mortality | Little and Leslie, 1999 cited in Fratkin et al., 2006 |
| 7 | 1999 | The Turkana of Kenya | Nomadic | Nomadic Turkana suffered substantially higher infant mortality than settled Turkana agriculturalists | Sheik-Mohamed and Velema, 1999 |
| 8 | 1991 | The Dobe and Kutse of Botswana | Sedentary | Shift to sedentism is associated with high incidence of anaemia, of chronic diseases and general high morbidity; higher morbidity among the sedentary Dobe and Kutse Basanva | Kent, 1991 |
| 9 | 1990 | The Turkana of Kenya | No significant difference | Health status of settled and nomadic children is about equivalent | Little and Gray, 1990 |
| 10 | 1990 | The Turkana of Kenya | Nomadic | Childhood disease is more prevalent among nomads than settled Turkana | Brainard, 1990 cited in Little and Gray, 1990 |

*Source: Author's research*

In particular, the visited study sites, which lacked clinics and veterinary services increased their risk of being potential epicentres of disease transmission (Coppock et al. 2013). A query search in Nvivo revealed that in Sankal, respondents indicated suffering mostly from diarrhoea and stomach-ache followed by eye diseases, cold and flu. In addition, respondents from all villages denounced the lack of quality healthcare services:

> "There is sickness. Before, life was different. Now, we suffer from eye diseases, chicken pox, heavy coughing, undernutrition, cold. This new prefect hasn't even looked at us nor visited us. There is no ambulance, no healthcare, only God knows what will happen. The women give birth here. Ali-adeh has water, has healthcare. We can't go back to see the government. They don't help us. There is a big problem of undernutrition. If the children fall sick, we take them to Dikhil City." *(SI9, 2012)*

As indicated by SI9, even the refugee camp of Ali-Adeh located in Ali-Sabieh region benefited from good quality water points and healthcare services. In addition, the NGO Cooperative for Assistance and Relief Everywhere (CARE International) and the United Nations High Commissioner for Refugees (UNHCR) implanted in the camp regularly provided nutritional and health support to the rural populations displaced by the 2010-2012 drought. Since there was no health infrastructure in the villages, community members devised ways to transport the sick to the CMH in Dikhil City which was the closest clinic for all study sites:

> "When the children fall sick, thanks to the donkeys we take them to the hospital. We use ropes to attach the sick. They die by the time they reach Dikhil City. Why does Aoul[62] accompany you? He's one of those that carry the people to the hospital. Why don't you come and examine our girls? There was a doctor once that used to do that and he said that most of us had secondary infections from wounds because of the long trips to the well. After that, he just left. "*(SI4, 2012)*

However, even the CMH lacked basic health infrastructure and had only a handful of beds, non-hygienic locals, only one mobile ambulance and no essential medicine. As a result, the CMH cannot provide adequate services to rural nomads when they fall sick:

> "The other day, some guy got sick. They refused to bring an ambulance. We thought we were in Djibouti and still, there was no answer from the government. They send an ambulance to people who live 50 km

[62] Aoul was our guide in Sankal, Dikhil region.

away from Dikhil City while we are only 27 km away. We don't know what they think about us. And so, we literally thought we were considered as if we were in Ethiopia even though we can see the Djiboutian flag from here. We took the sick man to Garsale-Dabba with my donkey to find a car there (6 km away)." *(SI3, 2012)*

"We have no car for transportation, no clothes, no medical centre. If you get sick, by the time they call an ambulance to get you, the person dies. Only a few people have the chance to be evacuated by the ambulance. Most die before it reaches us. When the person dies on the way, what do you do? You need to go back. Now you can see how many are in the graves. Children are suffering and also dying because of hunger." *(SI32, 2012)*

Underfunded, the CMH needed to be refurbished, increased in size and supplied with more medicines. Lastly, there was only one physician for 40 000 inhabitants. In those study sites covered by the telephone network, equipped with a rural phone and/or having a military base there, community members could call the hospital in order for an ambulance to be dispatched to transport the sick to the CMH. Unfortunately, as stated by SI3, in most cases the ambulance was unavailable and therefore volunteers would carry the sick to the hospital by donkey or on foot, walking day and night to reach the hospital. As mentioned by SI32, the sick recuperated on their own or merely died in the village.

Other variables linked to sedentarization which severely increased health risks in the study sites and elsewhere in Africa (Kent 1991, Fratkin et al. 1999, Barkey et al. 2001, Glew et al. 2004, Coppock et al. 2013) included accumulation of human wastes nearby and/or in settlements, greater exposure to contaminated water sources, dietary changes, decreased physical activity, and increased contact with a greater number of people. In turn, since disease is one of the direct causes of malnutrition, higher morbidity levels may translate into higher malnutrition rates among sedentary communities compared to nomadic ones (Fratkin et al. 2004) although there is still some debate concerning the association between nutrition status and disease type (Barkey et al. 2001).

Similarly to Barkey et al.(2001)'s study of the Turkana, the settled men in the study sites cited the loss of livestock through drought as the event which forced their families to settle. The loss of animals for the Afars and Somali-Ise impacted not only the natural and financial capital of the

household they were in charge of supporting, but also had an effect on their identity, pride and authority as nomadic herders (Barkey et al. 2001).

There is a further aspect of human health which needs to be considered in relation to the impacts of sedentarization amongst the pastoralists of Djibouti. The dramatic transformation in lifestyle, social fragmentation from the ethnic nomadic group unit they used to migrate with (although it was reported that certain families settled together), dietary change as well as morbidity and mortality rate changes associated with sedentarization may lead to psychosocial stress (Little et al. 1990). This health risk has been shown to play a role in the suppression of immune function (Carcillo et al. 2012) which contributes to increased susceptibility to adverse pathogens, viruses and/or disease vectors encountered in the study sites (see the four case-studies in Chapter Seven). As far as is known, this issue has not been investigated in studies of pastoralists' health risks associated with sedentarization. To evaluate the significance of the association between stress and immune function as a relevant health risk linked to loss of livestock and sedentarization in unsafe conditions, the literature was reviewed to find dominant trends in the debate. For this review, Lucini and Pagani (2012)'s definition of stress as a "psychological, behavioural and physiological (or pathophysiological) consequence of the interaction between a subject and a stressor", namely loss of livestock and/or loss of family members in the case of this research, was used. The results of this review are presented in descending order by date of publication in Appendix 13.

The review (Appendix 13) shows that most studies demonstrated that stressful events have an influence on the incidence of diseases through "negative affective states" such as depression and feelings of anxiety (Cohen et al. 2007). On the long-run, if settled rural families failed to return to their traditional nomadic way of life, there was a risk for them to develop permanent changes in their emotional, physiological and behavioural responses to pathogenesis. Hence, sedentarization would increase susceptibility and recovery capacity of settled individuals in case of disease, and especially so if they lived in unsafe conditions. Although a more rigorous study on depression in rural areas of Djibouti is needed to validate it, ethnographic work revealed that there were many sad, disillusioned and depressive facial expressions among the communities, and especially among women. The latter reported that their husbands, ashamed of not being able to provide for their families, would prefer to leave the house and live away from the household. This observation must

not be taken lightly since there are studies which established that there was a strong causal association between stressful events and major depressive episodes in the life on an individual (Hammen 2005).

The hypothesis investigated in this chapter is that livelihood change and sedentarization is associated with improvements in human vulnerability and food security status because of better access to social services (health centres, job opportunities and schools). On the contrary, this section showed that the sedentarization process of the Afars and Somali-Ise in the study sites sites was associated with increased vulnerability manifested through higher exposure and susceptibility to infectious diseases and mental after-effects on their immunity. This vulnerability is an expression of pastoralists' unsafe conditions of living which include unprotected wells, higher propagation of disease because of higher density of people and lack of access to quality health services. The next section assesses the discussed hypothesis from a nutritional point of view.

## 8.3 Linking sedentarization with nutritional change

As noted in section 4.2.3 of Chapter Four which included a brief discussion of the repercussions of livelihood strategies on nutrition, Kenyan pastoralists had a caloric intake that ranged from 1080 kcal/day for the Maasai women and children to 1350 kcal for the Turkana (Fratkin et al. 2006). Their diet was therefore protein-rich but poor in calories. This research found that the Afar and Somali-Ise pastoral diets were analogous to those of the Maasai, the Turkana, the Rendille, (Fratkin 2001a) and the Fulani (Glew et al. 2001). Similarly to Kenyan pastoralists (Sellen 1996, Fratkin et al. 2006), respondents said that milk and milk products were their main source of food whereas meat products were rarely consumed except during social events involving traditional rituals and/or social obligations. According to Guedda (1984), the caloric content of food consumed three decades ago in rural Djibouti was already inferior to international standards. Milk products and, to a lesser extent, meat products were produced in the household while cereals were purchased on the market. Fieldwork found that households also consumed wild foods and purchased tea, sugar, cereals and oils to enrich their diet. However, in contrast to other pastoral peoples of East Africa (Sellen 1996, Fratkin et al. 1999), respondents indicated that they did not consume any blood nor

did they consume any cheese, which was also confirmed by Guedda and Godet (1984, p.56). Studies on nomadic pastoralists' nutritional have indicated that they generally suffered from deficiencies in minerals and/or vitamins and iron (Greene 1974) which were more significant among women and children than men (Fratkin et al. 1999). According to Sellen (2000)'s study among the Datoga of Tanzania and Loutan and Lamotte (1984)'s work among the Wodaabe of Niger, gender-biased undernutrition could be explained by the "particularly arduous workloads" of these groups which included herding small livestock, digging and maintaining surface wells and collecting water and fuel wood[63] (Fratkin et al. 2006).

As is the case throughout East Africa and the world, pastoral diets in Djibouti are closely related to the succession of rainfall and dry seasons. Lean periods alternated with plentiful periods. During rainy seasons, Guedda (1984, p.56) has reported that it was not uncommon to see pastoralists throwing away excess products (including milk) derived from livestock since nomadic households lacked the means to stock up on food supplies. During the drier periods, lack of rainfall was accompanied by reduced forage plant growth, reduced animal consumption, reduced milk production and therefore low level of fat and protein consumed at a time when more effort needed to be spent to find grazing areas and water (Fratkin et al. 1999, Fratkin et al. 2011). As a result, *reer gura* pastoralists would adapt their diet according to the seasons. Milk was mainly consumed during the *diraac/sougoum* and the inland *karan/karma* rains and was complemented with cereals by selling small livestock. On the other hand, dietary intakes decreased during dry seasons and drought years not only because of lower milk yields but also because households were not able to fill this dietary gap with carbohydrates by purchasing cereals, sugar and tea (Fratkin et al. 2006, Fratkin et al. 2011). One underlying reason proposed by Sellen (1996) was the increase in grain prices, lower market demand for livestock and poorer condition of sale livestock during these dry periods. Yet, he found limited evidence showing significant differences in health impacts in the rainy and dry seasons (Sellen 2000). Further, low levels of milk consumption among the Fulani were not found during the dry season in Chad since small livestock, which is known to reproduce relatively quickly, was available. At the same time, Arab women consumed milk at a lesser frequency than men, especially during the dry season (Schelling et al. 2005).

[63] The nature of sedentarization's after-effects on gender roles and labor is discussed in the next section.

This section examines if sedentarization is an adaptive strategy that alleviates drought stress by providing a more consistent and adequate diet and therefore decreases the risk of becoming food insecure. Unfortunately, time and logistical constraints did not permit comparisons to be made between nomadic and sedentary groups in the context of this study. To evaluate the validity of the hypothesis, the literature was reviewed from 1973 to 2011 for studies which have focused on comparing nutritional and dietary differences between nomadic and settle communities in Africa. This review is supplemented by fieldwork testimonies. The review focused on studies targeted at children because comparative study based on differences in child growth indicators exhibit more significant and meaningful results than those based on older individuals (Seaman et al. 1973, Little et al. 1990, Fratkin et al. 2004). The results of this review are summarized and presented in descending order by date in Table 8.4.

The review indicates that former nomadic pastoralists who had settled benefited from increased access to health care, formal education, and markets but experienced a decrease in the nutritional value of their diet and exposure to new health hazards (Nathan et al. 1996, Sellen 1996, Fratkin et al. 2011). Overall, nine studies out of thirteen (69%) have found that malnutrition rates tend to be higher among sedentary/settled communities compared to nomadic communities. Even though protein-rich milk, meat and trade of camels, cattle, goats and sheep fluctuate depending on the behaviour of rainfall, nomadic households provide better nutrition to children, even during drought periods. In contrast, sedentary pastoralists owned less livestock that tended to be herded away from the settlement (Nathan et al. 1996, Fratkin et al. 1999, Fratkin et al. 2011). Sedentary children's diet contained carbohydrates (especially for those benefitting from supplemental feeding in schools in the study sites), fats, and sugars but severely lacked protein for their growth compared to nomadic children (Glew et al. 2003, Fratkin et al. 2004, Fratkin et al. 2006).

Various reasons could explain decreasing nutrition levels associated with sedentarization. Firstly, fieldwork results indicated that access to nutritious foods in the study sites depended on household purchasing power, regularity, quality and quantity of food aid and adequate plant growth for those that practised agriculture. For nomadic pastoralists, rainfall occurrence was usually associated with pasture regrowth (quicker in non-equilibrium environments than equilibrium contexts) and the speedy reconstitution of herd losses.

**Table 8.4 Comparative table between nomadic and sedentary child malnutrition rates in Africa**

| Study number | Date published | Pastoral communities | Group with higher malnutrition level | Citations | Sources |
|---|---|---|---|---|---|
| 1 | 2011 | The Rendille of Kenya | Sedentary | Children in the nomadic community were heavier and taller than their same-aged counterparts in the four sedentary communities | Fratkin et al., 2011 |
| 2 | 2006 | The Rendille and Ariaal of Kenya | Sedentary | Children living in all settled communities studied had higher rates of malnutrition and stunting than the nomadic community | Fratkin et al., 2006 |
| 3 | 2004 | The Rendille of Kenya | Sedentary | Far poorer growth patterns for children from sedentary communities relative to same-aged children from nomadic pastoral community | Fratkin et al., 2004 |
| 4 | 2003 | The Fulani of Nigeria | Sedentary | A pastoral nomadic diet allows children to cope better with stress and hardship caused by unfavorable climate or civil unrest | Glew et al., 2003a |
| 5 | 2001 | The Maasai, Boran and Rendille of Kenya | Sedentary | Far fewer cases of child malnutrition in the nomadic pastoral community of Lewogoso than in any other, sedentary communities | Fratkin, 2011 |
| 6 | 2000 | The Rendille of Kenya | Sedentary | Settlement in Korr and its associated changes in subsistence and lifestyle results in diminished nutritional status of young children | Shell-Duncan and Obungu Obiero, 2000 |
| 7 | 1999 | The Ariaal and Rendille of Kenya | Sedentary | Sedentary communities show far higher levels of malnutrition than the nomadic sample | Fratkin et al., 1999 |
| 8 | 1996 | The Rendille of Kenya | Sedentary | More wasting among town children during dry year; nomadic child malnutrition significantly less than that found in towns | Nathan et al., 1996 |
| 9 | 1993 | The Turkana of Kenya | No significant difference | Settled infants were slightly longer, but nomadic infants were heavier and fatter. Head circumferences were the same. | Little et al., 1993 |
| 10 | 1992 | The Boran of Southern Ethiopia | Sedentary | 54.9% of the sedentary children in Elka were stunted compared to 19.5% among the nomadic pastoral children in Dubluk; stunting occurred at an earlier age in Elka | Lindtjørn et al., 1992 |
| 11 | 1990 | The Turkana of Kenya | Nomadic | Results indicate that settled children were larger than nomadic children in almost all measures of size and body composition | Little and Gray, 1990 |
| 12 | 1974 | Unknown ethnic group(s) from Mauritania | Nomadic | Acute malnutrition was detected significantly more frequently among nomadic children than sedentary children | Greene, 1974 |
| 13 | 1973 | Unknown ethnic group(s) from Mali and Upper Volta (Burkina Faso) | Nomadic | Malnutrition was found in about 20% of children in sedentary groups and twice as often in migratory groups | Seaman et al., 1973 |

*Source: Author's research*

For instance, Lindtjørn et al. (1992) found that improvements in the nutritional status of nomadic pastoral children would occur soon after the occurrence of the main rains while it would occur later and after the main harvest among agricultural children. Other reasons include changes in market integration, the nature of subsistence activities and the access to healthcare (Shell-Duncan et al. 2000). Since morbidity plays a significant role as one of the direct causes of malnutrition, inadequate access to proper health services in locations lacking health facilities as in the study sites could contribute to increased risk of chid malnutrition. In addition, the literature indicates that sedentarization is often accompanied with wealth differentiation and increased community disparities which could also determine children's adequate access to nutritious foods (Lindtjørn et al. 1992, Fratkin et al. 2011).

An examination of Guedda and Godet (1984)'s results and this study's ethnographic work and semi-structured interviews also yielded similar results to the above. In rural Djibouti, it has been estimated that an average nomadic pastoral household composed of six members (which is equivalent to a bit less than five adults) would need approximately 13 000 kcal and 320 grams (g) of protein per day. To satisfy these needs, the family would need to ingest about 16.5 litres of milk/day or twelve litres supplemented with two kilograms of meat, or eight litres of milk complemented with four kgs of meat (Guedda et al. 1984, p.55). Similarly to the Fulani of Niger (Ekpo et al. 2008) and the Turkana in Morelum (Barkey et al. 2001), as Afar and Somali-Ise families settled, the children and women reduced their milk intake and replaced it by plant foods and/or food rations given by the WFP. With fewer animals owned (especially in Bondora and Sankal), the settled pastoral diet was mainly composed of cereals and legumes with a much smaller proportion coming from animal sources such as milk. Such a diet supplies lower protein and higher caloric content to settled pastoral households compared to when they were nomads.

All in all, with this dietary change, the literature on livelihood change linked to sedentarization seems to indicate that malnutrition among settled communities is higher than among nomadic groupings (Ekpo et al. 2008) because of the decrease in the protein content, an element crucial for reproductively active pastoral women and for infants and growing children (Fratkin et al. 2011). Further, nomadic children are far better adapted to environmental fluctuations and cyclical droughts while settled children usually exhibit "maladaptive biological" symptoms linked to

sedentism (Fratkin et al. 2004, Fratkin et al. 2011). In addition, a transition from a purely pastoral mode of living to one based on irrigation agriculture as in Hanlé 2 exposes their livelihood to scanty and unpredictable rainfall needed to recharge underground aquifers to provide sufficient water for plant growth. As is the case with the settled Turkana (Little et al. 1990), without sufficient infrastructure (deep cemented wells, motor pumps and petrol), respondents indicated that it was difficult for them to produce enough food to maintain their families. Finally, fieldwork results also indicate that the nomadic pastoral production system seems to be more effective, in both wet and dry years, than the sedentary system, whether it is agro-pastoral or fully agricultural despite the benefit of food supplementation. As a response, it has been suggested by Shell-Duncan and Obungu Obiero (2000) that since women play a central role in determining and ensuring child health, interventions aimed at improving the financial and economic status of women would in turn improve children's well-being in settled areas.

## 8.4 Sedentarization and gender: re-configuring household labour divisions

This section examines the socio-environmental impacts of drought on pastoralists and how these fed into their current vulnerability profile. It intends to show how changes in pastoral livelihoods progressively reconfigured social relationships within households. The information presented was collected through group discussion sessions. Since there were commonalities between the different villages, the following analysis adopts an overall perspective on social-environmental changes. Idiosyncratic effects are analysed when necessary.

In spite of various attempts at creating vegetable gardens, in most cases, these initiatives failed due to prolonged lack of rainfall affecting irrigation, water access problems, lack of knowledge about the workings and needs of plant growth and seasonal species' specificities. Ethnographic work and informal discussions with women revealed that as traditional nomadic pastoralists, sedentary men lacked training and financial resources, and this made it difficult for them to find suitable jobs. Installed far from the city in remote areas, they also had little information about potential jobs. The majority of men who did not rear animals resorted to selling charcoal and seeking daily work as a watchman, security guard or manual labour in Dikhil City and Djibouti City. Those who found

work usually sent part of their salary to the regional capital through a money transfer agency called Dahabshiil.

**Table 8.5 Location of men from Sankal**

| Father's location | Percentage |
|---|---|
| Sankal | (33) 76.7 |
| Countryside | (1) 2.3 |
| Dikhil City | (4) 9.3 |
| Djibouti City | (2) 7 |
| Unknown | (3) 4.7 |
| Total | (43) 100 |

**Table 8.6 Occupation of men from Sankal**

| Father's occupation | Percentage |
|---|---|
| Idle | (18) 40 |
| Fetches water | (12) 26.7 |
| Keeps animals | (3) 6.7 |
| Disabled | (6) 13.3 |
| Dead | (3) 6.7 |
| Unknown | (3) 6.7 |
| Total | (45) 100 |

*Source: Author's research, the number in parenthesis is the count number.*

There are very few alternatives for them. Thus, in Koutabouya, if men were not keeping livestock in the mountains or seeking work in the city, they could be seen talking among themselves under a tree while chewing *khat*. Illiterate, without papers, uneducated and untrained, employers rarely accepted to enrol them in their businesses. This economic situation has gravely tainted their social status in their respective households. Male respondents indicated that they felt ashamed at not being able to provide for their families anymore. One fieldwork indicator of changes within the household was the relatively clear absence of men in the village. In Sankal, 86.8% of respondents found in households were female and the majority of husbands (76.7%) were somewhere in Sankal or had left for the city in Dikhil City or Djibouti City (Table 8.5).

One positive side was that men tended to spend more time in the household than before and therefore helped their wife(s) with daily chores such as fetching water and/or taking care of the children. As seen in Table 8.6, 40% of husbands were idle, 26.7% fetched water and 6.7% still kept what little livestock they had left. Feelings of the father linked to not being able to provide for his family anymore led men to sleep outdoors and/or leave the village in search of other opportunities:

> "When the cattle dies, the father's morale goes down. They see their children and wives suffer and they prefer to leave to get a means of living. Since they can't find anything outside, they feel bad returning empty handed and therefore do not return." *(SI0, 2012)*

Group discussions with the men indicated that, unable to satisfy the needs of their family, wives were sometimes so frustrated that they rejected their husbands even though they did understand the unusual difficulties affecting livestock rearing. In any case and similarly to Somali women from Ethiopia, the lack of opportunity for men and the consumption of *khat* by most of the idle men contributed to increasing the burden on women to provide for themselves and their families (Kipuri et al. 2008). Traditionally, women were in charge of making and selling handicrafts, gathering wild foods, collecting fuelwood and water (Aregu et al. 2007), cooking, preparing and selling milk and animal fat as well as gathering and selling charcoal. They were also in charge of washing clothes and caring for the children. Livelihood transition to a sedentary mode of living meant that both men and women had less livestock-related tasks to perform but women and children's leisure time did not increase. Similarly to settled women in other African countries, the women interviewed were in charge of childcare, household maintenance and cooking. Sedentarization then increased labour time and effort for women in milking small stock and making long trips to collect water and wood (Fratkin et al. 1995) while children (especially boys) were enrolled in school (Bailey 2012). This was confirmed by female respondents who remarked that while men were not as 'busy' as before, women's duties had significantly increased.

Fieldwork indicated that added to their previous tasks, women spent twice or three times as much time as before in fetching wood and water. Respondents indicated that wood was used for cooking, boiling water, making coffee, providing light amongst other uses. Further, as women and children spent more of their time at home they were more exposed to smoking than before. As a result, respondents often reported smoke related diseases such as pneumonia and bronchitis. Children were usually in charge of keeping small remaining livestock nearby the village and/or fetching water. Those registered in school also fetched water outside school hours and in most cases were helped by their mother and siblings. The water needed to be fetched in the afternoon and early in the morning for women to cook food for lunch.

According to respondents, fetching water in the rugged terrain and mountainous landscape that characterizes the south-western part of rural Djibouti was 'torture'. Some stated that they asked the village Chief to get the school closed because of the pupils' hardship in fetching water that was one to two hours away on foot. However, the State refused for unknown reasons. In addition, only

those registered and who helped in fetching the water got to eat at the school. Unregistered children who stayed at home did not benefit from the school-feeding programme, although frequent exceptions were reportedly made by teachers. Even though it was hard for children to fetch the water, parents generally still preferred registering their children because they benefitted from the school-feeding programme, which helped the household provide for the rest of the family. Women and children often walked up to three-four hours per trip for food and water. The collection of water (and wood) exposed women to injury from falls and especially the risk of miscarriage (Aregu et al. 2007). As a result, various strategies were devised within and between households to complete these tasks.

In pre-colonial times, tribal solidarity served as a powerful protective asset in nomadic societies surviving in an environment where many natural livelihood-related components were ephemeral. Indigenous councils such as the *Fi'ma* for the Afars and the *Gendi* for the Somali-Ise made sure the group provided for the needy (Piguet 1998, p.172). Councils of notables arbitrarily required tribesmen to contribute financially to tribal expenditures without any appeal from the decision. Each community member had to "keep his door open to any needy person, whatever a man earned" because any returns on investment were at the tribe's disposal (Thompson et al. 1968, p.29). This traditional custom shared within and between households was present in the study sites. In Hanlé 2, Koutabouya and Dadahalou, herders related through friendship or kin tended to graze the animals of several households while others helped fetching water and/or farming. Tasks were divided up and the workload was shared between several tribal groups and/or families. Also, as various household members were sent to work in the cities, urban households affiliated to certain rural households sent a significant portion of gained revenues to their families as remittances. At the same time, this process created a lack of productive human labour and capital in rural areas while the number of unproductive household members (the elderly and the children) increased. On the short term, tribal customs prevented the urban Somali-Ise and the Afars to fully enjoy the fruits of their labour and thus suffered from the lack of privacy in their personal economic pursuits. In the long-run though, this adaptive strategy allowed groups of rural households to survive in *badia*.

For instance, field results showed that women would unite, help each other and cooperate in fulfilling their respective duties. One such indicator of solidarity remarked was that women would

collaborate in collecting water, wild foods, building homes which was very helpful for those who were either ill, pregnant or who had recently given birth and were unable to perform demanding tasks in the household (Bailey 2012). In addition, men, livestock-less, were reported participating in various tasks exclusively reserved to women such as fetching water and caring for children when women were away from the homestead (see Table 8.6 earlier).

Elderly women, who were still very much taken care of, respected and listened to for advice, reported that, as in the past, young pregnant women worked as much as non-pregnant women until delivery. However, this is more problematic now as they are much weaker and more tired than before. One of them stated that:

> 'In our time, we would work until the moment of delivery. We could do it because we were better nourished. For us, working, even pregnant, was normal and accepted. Everybody was working and had their tasks to accomplish, why not us? But now, women have much more difficulty because of being ill-fed. They are more tired. They fall sick more often' *(Group discussion in Koutabouya, 2013)*

In the past, pregnant women used to be fed with maize, milk and wheat-based foods. Nowadays, pregnant women are only fed with WFP's food rations with portions equal to those of other relatives. The elderly complained that these foods were not sufficient for both the mother and her growing baby. Another old lady said:

> 'Look at them: they are young and yet they look like old ladies. They are always tired and do not produce enough milk to feed their children. They are hungry. Before, there was meat, goat milk, butter and maize in abundance.' *(Group discussion in Bondora, 2013)*

When drought conditions were still bearable and livestock were plenty, women could rest up to seven days after having their baby. Nowadays, overwhelmed with duties, women's resting time decreased and varied depending on the amount of help they got from their relatives. It was reported that sometimes women would deliver in the morning and the same evening would already be busy preparing fire and the meal for the household.

It was also reported that the imbalance between the amount of effort required from them and the amount of food ingested had in several cases made them lose their babies. Further, when meat, milk and maize were more readily available and accessible before, guests were served first, then the father, followed by the children and then the mother. Nowadays, children are served before anybody else in the household, followed by the father and then the mother is served last. Consequently, even though mothers worked harder than before and were more vulnerable, their well-being was not prioritized even though the father sometimes tended to help his wife in fetching water or, as in Hanlé 2, cultivating and harvesting. As a result, biological, social, cultural and economic factors increased rural women's vulnerability to reproductive health problems (Mohamed Ahmed 2005).

Other significant detrimental changes reported included modifications in breastfeeding habits due to drought-related labour time allocation changes. Breastfeeding formed an integral part of traditional nomadic life. One hour after birth, the baby's lungs and stomach were cleared by administering it tea made of mountain herbs in order to make it throw up before breastfeeding it. Women knew of the advantages of the colostrum in the milk produced in the first few days after birth, and of breastfeeding generally for the health of their babies, and therefore tended to exclusively breastfeed the baby until he reached two years of age. When the moment came to wean the child, cereal mixed with maize and milk would be administered before eating from the familial plate. At the time of data collection, mother respondents stated that they tended to introduce other foods before six months (tea, goat milk, or normal food) for various reasons. Firstly, mothers were too tired because of being submerged with their present duties combined with inadequate food intake. Secondly, since the mother had to dedicate more time to fetching wood and water, she spent more time outside the house and would leave her baby at home to be taken care of by a relative[64]. It was reported that mothers could wait up four to five hours before breastfeeding their baby which had a negative impact effect on breast milk stimulation. Thirdly, since men spent much more time at home and married only once due to resource scarcity for bride-wealth (dowry), they no longer waited for the end of the breastfeeding period to resume intercourse. As a result, the time-frame

[64] When the baby is still light, the mother carries it on her back while fetching wood and water and breastfeeds it when needed. Otherwise, the baby stays at home with the maternal grand-mother, a female neighbor or an older sister. Otherwise, the baby must wait its mother's return to be breastfed while she attends to her tasks (meal preparation, dish washing, clothes washing, caring for older children or small livestock keeping).

between births was shorter than before (about one birth every twelve months) and as soon as a woman got pregnant, breastfeeding stopped. Lastly, the mother's milk was less nutritious than before and therefore did not satisfy the child as much as before. Thus, complementary feeding was often needed. As weaning tended to happen before two years of age, it had important consequences on child health which, mixed with lack of hygiene because of water scarcity, could lead to malnutrition. Childhood malnutrition could lead to life-long detrimental health effects in later life.

There were also effects on the nutrition of older children. Elderly women reported that children used to be fed with goat milk, cooked maize, water and sugar. Nowadays the child would have the same diet as his parents', meaning rice and *lohoh* (type of local pancake made from white flour) which is more difficult to ingest. Female respondents indicated that the child had difficulty swallowing the white rice (which was eaten dry) and the *lohoh* made of white flour. There were also impacts on hygiene for children. When water was more readily available and accessible through mobility and the use of donkeys for carrying it, children used to be washed around wells and in *oueds*. With current water scarcity conditions, water is used for drinking and cooking before anything else. Quantities fetched were often too small to fully wash children on a daily basis which could be as problematic as access to clean water to drink (Cairncross et al. 2010). Other impacts of sedentism were more mixed as there were advantages for the children but disadvantages for their mothers. In the past, children were in charge of keeping shoats. Girls would often help their mothers in their daily chores such as caring for younger brothers and sisters, washing clothes, cooking and fetching water. With drought, settling of households and the growing perception that education serves as an important long-term asset for the household, at least one or two children now tend to be sent to school.

## 8.5 Managing food insecurity

### 8.5.1 Rural households' adaptation capacity to 'normal' drought occurrence

This sub-section attempts to answer part of the fourth research sub-question in terms of defining the adaptive capacity of rural pastoralists. Chapter Two mentioned that in the context of this study,

disaster risk is seen as R = H x V/C, with ‘R’ being disaster risk, ‘H’ being the hazard, ‘V’ being vulnerability (exposure and susceptibility) and ‘C’ as the adaptive capacity. As a reminder, adaptive capacity, which includes adaptive mechanisms, coping strategies and adaptive strategies, is narrowly linked to vulnerability. Coping strategies are seen as those immediate actions taken within the household to ‘buffer’ temporary stresses and shocks threatening household food security. This sub-section shall assess the coping strategies of rural households in Hanlé 2, Koutabouya, Bondora and Dadahalou as a reflection of their level of vulnerability to drought and food insecurity risk. At first, an overall picture of the behaviours used across the villages is presented. Secondly, to gain more insight into the differences that characterized each village, the results were disaggregated per household and per coping strategy to probe for certain meaningful patterns and/or findings between villages.

The Coping Strategy Index (CSI) is a quick tool to measure household food security and the impact of food aid in humanitarian emergencies programs. Developed in Uganda, Ghana and Kenya, it has been used for early warning and food security assessment and monitoring in at least nine other African countries and several other countries in the Middle East and Asia. The CSI evaluates the behaviour of individuals and quantifies the decisions and choices made by people when they cannot access enough food. There are a number of fairly regular behavioural responses called coping strategies that are used by households to manage food shortages. These coping strategies are usually identified through observation, group discussions and individual interviews. International organisations consider that it is faster, easier and cheaper to collect information on coping strategies rather than on actual levels of food consumption. Therefore, the CSI is deemed an appropriate tool for emergency situations when other methods are not practical or applicable.

To generate the CSIs for Hanlé 2, Koutabouya, Dadahalou and Bondora, the first step consisted in making sure the answers to the general question were based on a coherent list of coping behaviours for each village (see Appendices 2 to 5). It is a fundamental principle of the construction of the CSI. Indeed, it would have been useless to ask people about strategies they did not use. Similarly, the strategies that were locally used were integrated to generate meaningful results. Coping behaviours are idiosyncratic and vary according to the social-environmental context, the livelihood profile and specific conditions. Hence, the list of strategies incorporated these factors into account,

including local practices that were actually used. The second parameter that needed to be set was the recall period which determined the use frequency of those specific behaviours. In the case of this study, a recall period of seven days was chosen in order to generate results as accurate as possible. Thirdly and under the guidance of the author, a severity classification was generated through several focus groups at the community level and helped the research team in assigning a severity score to individual strategies. From the respondents' answers, the severity scores were established (see Table 8.7)

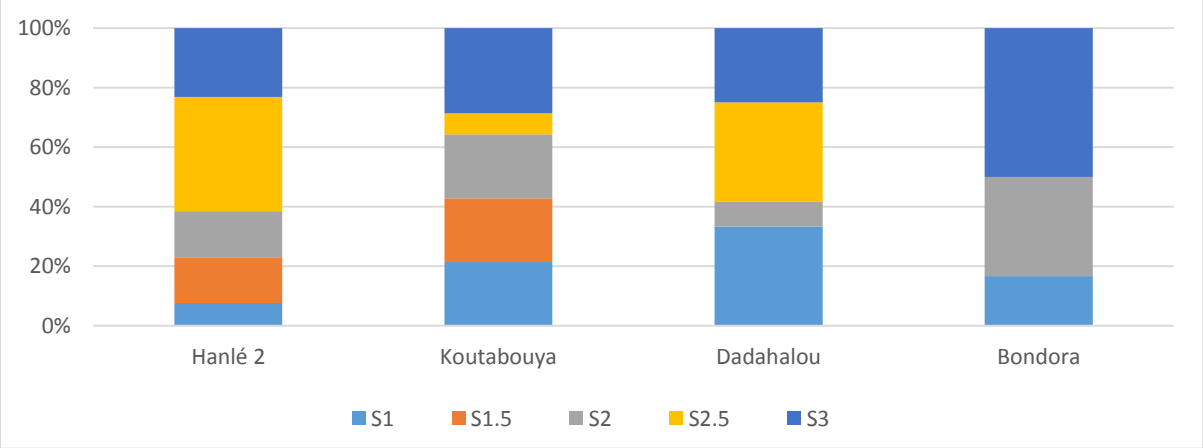
**Table 8.7 Score ranking and their respective severity level**

| **Scores** | S1 | S1.5 | S2 | S2.5 | S3 |
|---|---|---|---|---|---|
| **Severity** | Very low | Low | Moderate | High | Very high |

*Source: Author's research*

Based on Table 8.7's ranking, a severity score was assigned to each of the coping strategies. Finally, the frequency of a specific behaviour was weighted according to the perceived severity score of this behaviour. The calculated scores for each coping strategy were then added up and averaged for each study site. The index obtained expresses an idea of the current food security status in each village which then can be compared for a cross-sectional understanding of food security management across the dominant livelihood profiles in each community.

**Figure 8.1 Percentage of the number of coping strategies per consensus severity weight in each study site**




*Source: Author's research*

Since the CSI questionnaire used in each village was tailored to the results obtained from pre-organized focus groups for the selection of coping strategies that were actually known to be used in each village, it is believed that there is some degree of comparison possible between all four villages. The possible comparison across contexts was also previously mentioned in Chapter Three. As expected, Figure 8.1 shows that 50% of Bondora's coping strategies were classified as very highly severe (S3). Then, Hanlé 2 households classified 61.5% of their coping strategies as high severity or above (S2.5 and above) whereas in Koutabouya and Dadahalou, all strategies were more or less well-represented for the different severity scores. This might already be an indication that households from these two villages might be better able to manage food shortages than those in Hanlé 2 and Bondora. This claim, among others, is revisited throughout the section.

- *Common trends and differences between communities*

Table 8.8 and Figure 8.2 indicate that Koutabouya has the lowest mean coping strategy index score (45.89) followed by Hanlé 2 (71.04), Bondora (88.39) and Dadahalou (89.46).

**Table 8.8 Coping Strategy Index (CSI) scores by study site**

| Villages | Number of households | Minimum CSI | Maximum CSI | Mean CSI | Standard deviation |
|---|---|---|---|---|---|
| Hanlé 2 | 100 | 10.0 | 118.5 | 71.0 | 15.2 |
| Koutabouya | 100 | 13.5 | 91.5 | 45.9 | 13.6 |
| Dadahalou | 100 | 43.5 | 123.0 | 89.5 | 20.6 |
| Bondora | 97 | 21.0 | 129.0 | 88.4 | 23.1 |

*Source: Author's research in collaboration with ACF*

The higher mean CSI of Dadahalou compared to that of Hanlé 2 might mean that Dadahalou households reached a critical point in surviving livestock numbers and they would be better off switching to some other form of sedentary livelihood as an ancillary strategy to improve their food security status. Dadahalou's mean CSI was comparable to that of Bondora's but there was some bias from food aid as a surviving strategy that was overwhelmingly relied upon in Bondora. Ethnographic work and informal discussions showed that Bondora households' dependency on food aid was higher than that of Dadahalou where households still had some surviving livestock

to rely on, albeit at an alarmingly low number, compared to Bondora's households who had no viable livelihoods left.

Although the four villages benefited from the WFP's food assistance programme, the generation of the CSIs did not incorporate food aid as a strategic behaviour in managing food insecurity since it was considered an external response that was not put into use by the households themselves. Dadahalou and Bondora households were known to live in more difficult conditions than Koutabouya and Hanlé 2 households and it seemed that their greater livelihood fragility was also correlated with greater economic disparity between households. This could be explained by the fact that since households in Bondora and Dadahalou owned fewer resources than those of Hanlé 2 and Koutabouya, there was less sharing between households. In addition, respondents indicated that pauperization was accompanied by a weakening of their faith in tribal community groups which were not able to provide for those individual households in need of assistance. This is exemplified in the following quote by SI29 from Sankal:

> "We had a lot of animals, camels but they all died. Nothing is left. Life was comfortable and the animals were healthy. They would produce milk and we would not beg for things. When we needed money, we would sell our animals. We came here when we lost them. I used to have camels and goats but no donkeys. People used to help each other before but now it's not possible anymore. We are all dying of hunger. How can we help each other? There wasn't any fight, it was peace. Life is really hard now. We just survive. We suffer from thirst and hunger. Some organisation brings some food and they come once every month more or less." *(SI29, 2012)*

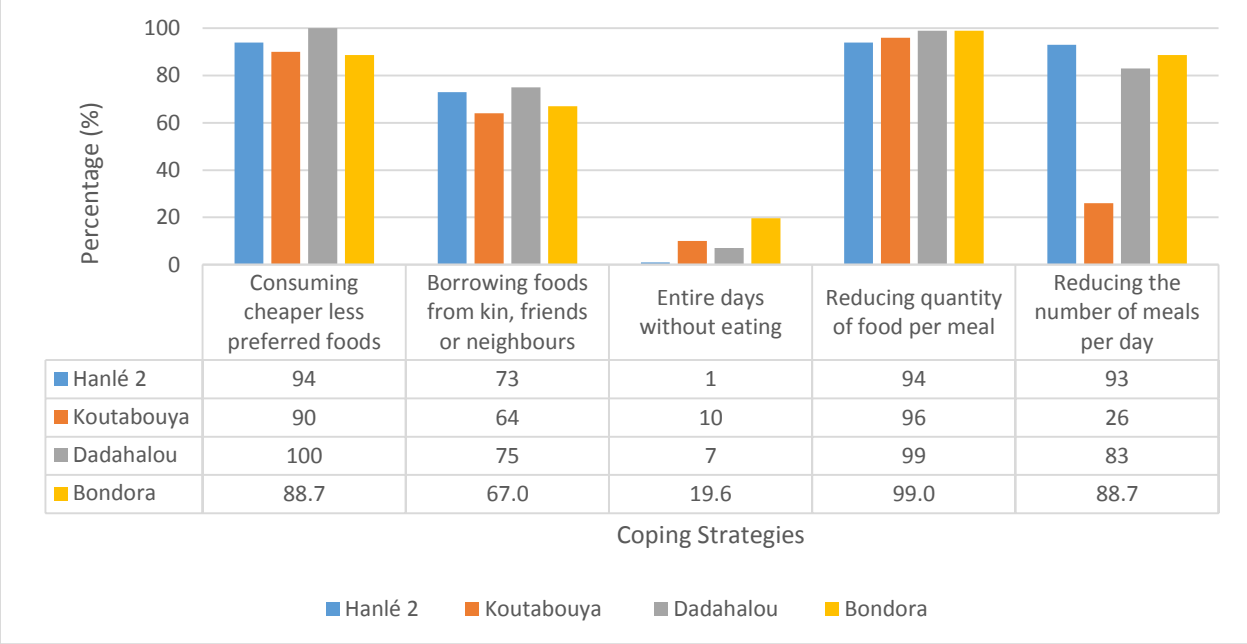
- *Coping strategies disaggregated by household*

To assess the popularity of each coping strategy in each village, the mean CSI for each community was disaggregated by household to examine the percentage of respondents having used each coping strategy at least once in the week preceding the interview date. The results for each village are presented in Appendices 14 and 15.

The patterns which emerged from the pie charts generated were quite striking and suggested the following insights into the adaptive capacity of the communities under study. First, one reason that

Koutabouya households were generally better off than Hanlé 2 households may be related to the fact that 89% of Hanlé 2 agro-pastoralists did not consume anything from their production and preferred to sell it on the market. In addition, although they owned less livestock, 50% of them sold genitor males in the last seven days compared to only 25% in Koutabouya. It is suggested that their reliance on market products exposed them more to not only changes in underground water recharge rate (and therefore rainfall fluctuations in the 'Issa ecosystem') but also to price fluctuations on the market compared to Koutabouya households.

**Figure 8.2 Percentage of respondents having used the five coping strategies at least once in each study site in the last seven days**




| | Consuming cheaper less preferred foods | Borrowing foods from kin, friends or neighbours | Entire days without eating | Reducing quantity of food per meal | Reducing the number of meals per day |
|---|---|---|---|---|---|
| Hanlé 2 | 94 | 73 | 1 | 94 | 93 |
| Koutabouya | 90 | 64 | 10 | 96 | 26 |
| Dadahalou | 100 | 75 | 7 | 99 | 83 |
| Bondora | 88.7 | 67.0 | 19.6 | 99.0 | 88.7 |

*Source: Author's research*

To extract common patterns across villages, a graph showing the use frequency of five coping strategies used in all four villages was created and is presented in Figure 8.2. The results show that use frequency of each coping strategy across the villages did not vary very much. Although the overwhelming majority of households across the four villages managed to obtain food regularly through a range of strategies, including borrowing, in each site there were a few households who had spent at least one day without eating. As can be seen, this was particularly serious in Bondora as one fifth of households had spent entire days without eating in the week before the survey.

Another common pattern across the study sites is that there was a high reluctance to sell assets and/or natural capital elements to obtain nutritious foods. However, the underlying reasons differed. Only 2%, 25% and 39% of households in Hanlé 2, Koutabouya and Dadahalou, respectively, reported selling agricultural plots, male animal genitors and assets. According to WFP reports, this is explained by the fact that animals are very weak, prices are generally too low and demand is usually inferior to supply (WFP 2008, WFP 2009). As confirmed by the WFP (2010, 2011, 2012), it is also deduced that selling animals and/or agricultural plots would directly affect the household's livelihood base which would further increase their food insecurity. In Bondora on the other hand, only 8.2% of respondents sold household assets to consume better foods and this was probably because Bondora households simply did not own much while for those who did have a few possessions, they were very reluctant to sell them. The much less vulnerable position of households in Koutabouya is evident from Figure 8.2. Whilst over 80% of households in the other sites were having to reduce the number of meals per day, only a minority, 26%, of Koutabouya households reported doing this which is a strong indication of the better food security status in that community.

More globally, 'consuming cheaper less preferred foods', 'reducing the quantity of food per meal' and 'reducing the number of meals per day' were among the strategies used by most households in all four villages (see Appendices 14 and 15). Similarly, spending 'entire day(s) without eating' and 'selling household assets' and/or 'selling genitor males' were among those strategies used by the lowest number of respondents. However, this does not translate any information on how often they were used, which is additional information needed to validate the popularity or unpopularity of certain coping strategies in the communities.
To further triangulate some of the main findings presented in this sub-section, coping strategies were disaggregated by use frequency for every village.

- *Coping strategies disaggregated by use frequency*

The previous sub-section assessed the number of households having used each coping strategy at least once in the week preceding the interview date. This sub-section examines the popularity of

each coping strategy in each village in terms of its use frequency or how often each strategy with its respective severity score was applied in the seven days prior to the interview.

The analysis of Appendices 16 and 17 shows that ‘consuming cheaper less preferred foods’, 'reducing the number of meals per day ' and 'reducing the amount of food per meal’ are the strategies which were used most frequently, with 92%, 89% and 86% of respondents who used each strategy, respectively, in the seven days preceding the day of the interview. This confirms the previous assumption that the vast majority of households opted for short-term reversible survival strategies to reduce food insecurity without jeopardizing the fundamental basis of their livelihoods. As shown in Hanlé 2 for instance, nearly nobody (2% of the time over the study week) reported having sold their agricultural parcels or selling their genitor males (93% never or only once) and their reproductive and/or lactating females (94% never or only once). Another strategy used as little as possible was spending ‘entire day(s) without eating', with 90% of respondents across the villages who said they had never used the strategy.

In addition, the data in Appendix 16 show that the most frequently used strategies among Hanlé 2 households have a high or very high severity score (S2.5 and above) according to the classification made by the households themselves. Further, 81.1% of households indicated having used these extreme strategies at least once, which is an indicator of their great difficulty in achieving household food security without adverse effects on their pentagon capital (especially human capital since these strategies have a direct effect on their nutrition status).

In Koutabouya, there is one strategy that particularly stood out compared to other villages which was 'gathering wild foods' with 67% of households having used the strategy for four days or more. Also, 85% of households reported having never sent anyone to the city to get wage labour (similarly to Hanlé 2 with a proportion of 89%). In addition, 97% and 98% of Koutabouya households never or only once used 'solidarity between next of kin’ and ‘eating at a neighbour’s house', respectively, in the week preceding the interview compared to Hanlé 2 (70% of households reported having eaten at a neighbour’s house one day or more), Dadahalou (76% borrowed food from neighbours one day or more) and Bondora (68% borrowed food from neighbours one day or more). These numbers might show their relative autonomy and the relative successful survival of

traditional pastoralism in the village compared to other study sites. These numbers are also good indicators of the autonomy of Koutabouya households in meeting their food needs compared to other villages.

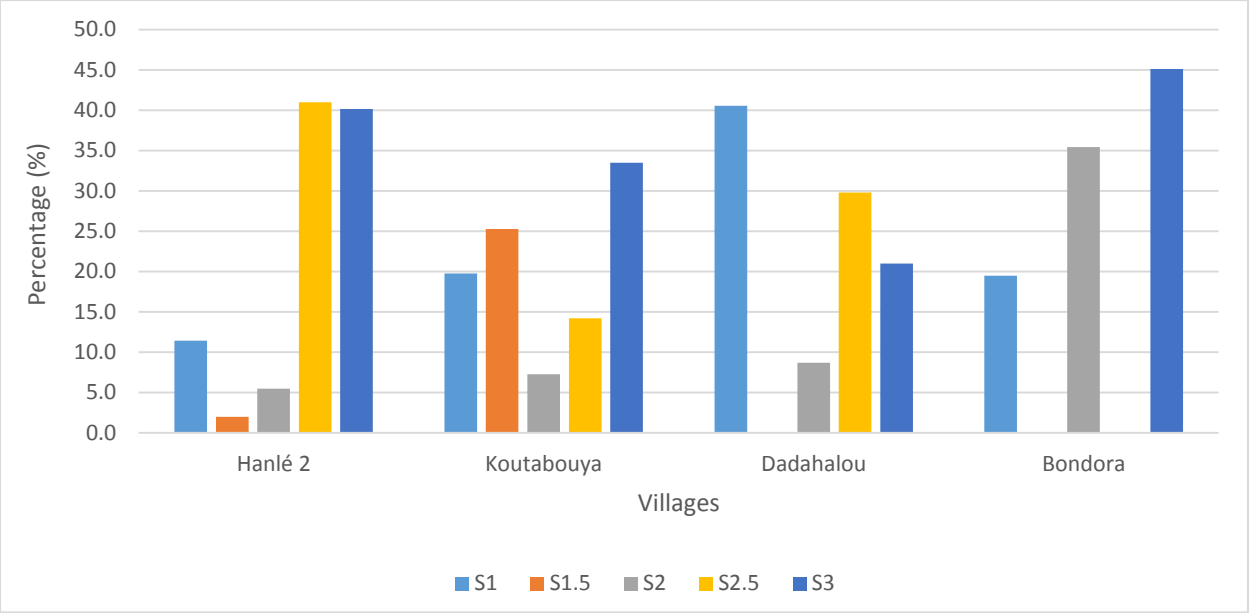
This sub-section validated some of the findings from the previous sub-section. However, the results discussed still draw an incomplete picture of the situation since the severity of the strategies used in the four communities was not yet addressed. This aspect is reviewed in the next sub-section.

- *Coping strategies disaggregated by severity score*

As expected, Figure 8.3 shows that Bondora exhibited a 45.1 use percentage of very highly severe coping strategies which was the highest proportion among all study sites. The second observation is that Hanlé 2, despite the diversification of their livelihoods with the practice of both pastoralism and agriculture and access to markets in Yoboki and Dikhil City, households reported using a dominant proportion of highly severe and very highly severe coping strategies (81.2% of the time). It is suggested that it was the second village after Bondora where households experienced the highest difficulty in satisfying their food needs. Then, the villages of Koutabouya and Dadahalou follow with coping strategies that were more or less well represented for each severity weight.

Since the existence of a variety of coping strategies is usually associated with a wider range of possibilities and thus a better chance of achieving food security, it is suggested that households from Koutabouya and Dadahalou who were known to own more livestock than in Hanlé 2 and Bondora, were probably the less food insecure study sites. In particular, 47.7 and 50.8% of the time, high or very high severity coping strategies were used in Koutabouya and Dadahalou, respectively.

**Figure 8.3 Use of coping strategies by severity weight in each study site in the last seven days**

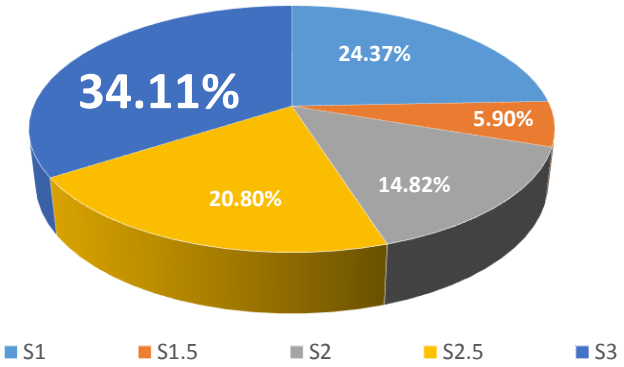



*Source: Author's research*

These findings contradict the hypothesis that Hanlé 2 households' sedentary agro-pastoral livelihoods were more reliable to attain food security than transhumant/semi-nomadic pastoral livelihoods found in Koutabouya and Dadahalou. In addition, although Bondora and Dadahalou yielded very similar mean CSIs, these numbers masked the underlying differences in the severity of the coping strategies. It is suggested that Dadahalou's mean CSI was skewed upwards because of the high percentage use of S1 coping strategies at 40.6%, which is more than twice as high as the next highest use frequency in Koutabouaya at 19.7%.

Finally, to have an approximate picture of the severity of the situation across villages, the CSI data of all study sites were merged to yield a proportion of the total use count of coping strategies by severity weight. As shown in Figure 8.4, all study sites combined (except Sankal), the highest proportion of the total use count of coping strategies used in the seven days prior to the interview date belong to the very high severity category at 34.11%, followed by very low severity strategies at 24.37%.

**Figure 8.4 Proportion of the total use count of coping strategies for each severity weight in the last 7 days**




*Source: Author's research*

Thus, overall, rural households from Hanlé 2, Koutabouya, Dadahalou and Bondora experience quite some difficulty satisfying their food needs without resorting to very highly severe coping strategies which themselves may lead to repercussions on their nutrition status and their health.

### 8.5.2 External response and assistance to pastoralists

This sub-section investigates the nature of external help provided to pastoralists in the study sites and their role in decreasing their level of vulnerability to drought. It therefore addresses the fourth research sub-question and more precisely the external side of pastoralists' adaptive capacity. Early ethnographic work in rural areas quickly revealed that the main external response received by pastoralists was food assistance. As remarked by Piguet (1998, p.183-184), it is rather a palliative measure against deficits in food supply and sufficient access to food which this research has shown to be more linked to long-term structural factors of vulnerability rather than short-term conjunctural ones.

On the government side, each district (or region) was placed under the authority of a Prefect who represented the President of the Republic. The prefect did not have proper resources at his disposal since all spending was managed by the State in the capital. This greatly limited the activities and/or initiatives at district level since the capital was the centre of social-political power and the locus of the majority of economic activities. Nevertheless, state officials in Dikhil Region (Prefect, Prefect assistants and sub-prefects) administered the populations and their conditions of living in

the region without any proper budget nor autonomy in decision-making. As a result and as confirmed by a great majority of respondents in all study sites, the villagers, whose needs were ignored often felt marginalized and abandoned.

The health and nutrition problems linked to the unsafe conditions of living covered in Chapter Seven touched upon the mandate of many government institutions including: The Department for the Administration of the Territory and the Environment (DATE), the Department of Prevention and Public Hygiene, the Technical Department of Health, the Department of Water, the Department of Agriculture and the Department of Livestock. Their range of intervention was crucial to many aspects linked to pastoralists' and agro-pastoralists' livelihoods and conditions of living. Yet, fieldwork showed that there was almost (if any) no contact between these government structures and rural populations from the study sites. In Sankal, 47 respondents out of 53 (88.7%) stated that the government did not help. Only one household indicated having been helped by the State once before for six months to allow their herds to reconstitute. The overwhelming sensation though is that pastoralists were left helpless as exemplified by SI3's quote:

> "We don't know what [government officials] think about us. And so, we literally thought we were considered as if we were in Ethiopia even though we can see the Djiboutian flag from here. The good thing has to do with the work of aid organisations. If the government does come, they accompany aid organisations but do not come by themselves. They don't help. We prefer those that work for these aid agencies. If you tell the Prefect, he'll say he'll relay the message to the minister and so on but nothing gets done. We prefer those who can freely help us. If you tell these aid organisations that we need help, they will come whether it has to do with medicine or food. We prefer aid organisations." *(SI3, 2012)*

In addition, there was a crucial lack of cooperation and coordination between these entities. Aside from the absolute lack of funding and infrastructure, these departments were managed by high government officials with self-appointed decision-making and budget allocation powers. As a result, even the few well-trained technicians working in these departments suffered from overwhelming constraints on their margin of action. Villagers in all study sites stated that there were frequent government surveys meant to assess the food insecurity situation. However, there was no follow-up nor concrete action taking place in tackling the problem of unsafe conditions in rural areas. One interviewee even said that at one time, some officials 'took pictures' as they went

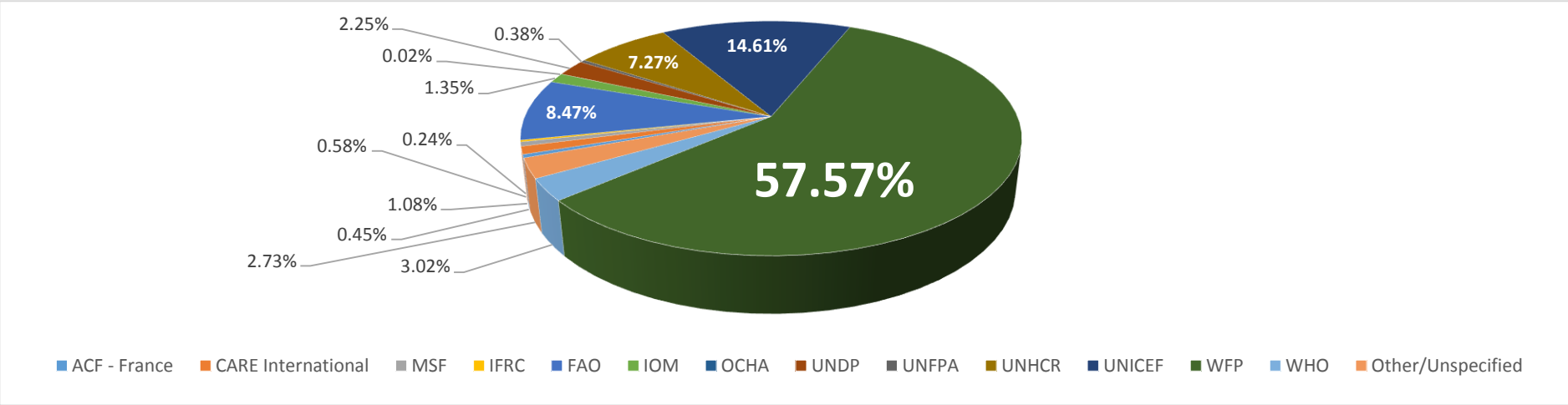
through the village of Sankal before leaving right away. Many settled pastoralists lost faith in their own government and felt as if they were abandoned.

In Sankal, five respondents indicated having received some assistance from an Arab organisation which "comes to help by giving out some gifts, goats, rice, sugar and some flour during the Eid Al Adha" (SI9, 2012). To have a better picture of the nature of humanitarian assistance in rural areas of Djibouti, the Financial Tracking System (FTS) database was consulted. The FTS compiles data and information from written statements, reports, pledges received from donors and/or appealing organisations. The data presented in this research is strictly funding covered by donors and confirmed by both donating and receiving parties. It does not include unsecured and/or funding requirements for activities.

As shown in Figures 8.5 and 8.6 and confirmed by respondents, the sole main organization that had the means to regularly intervene in the study sites was the WFP through its monthly food assistance programme. Aside from 2004, 2009 and 2010, it was noticed that the WFP had received much more funding for its programmes which are usually focused on food assistance through food aid and Food For Work (FFW), than other organizations working in sectors such as health (WHO, UNICEF, MSF) disaster management (OCHA and ACF-International), relief (IOM, UNHCR, CARE International and ACF-International) and agriculture and livestock (FAO, UNDP). With 57.57% of all the humanitarian funding secured for its aid operations from 2002 to 2013, the WFP was the single most active organisation in rural areas. Virtually every respondent in all study sites indicated receiving food aid from WFP on a more or less regular basis:

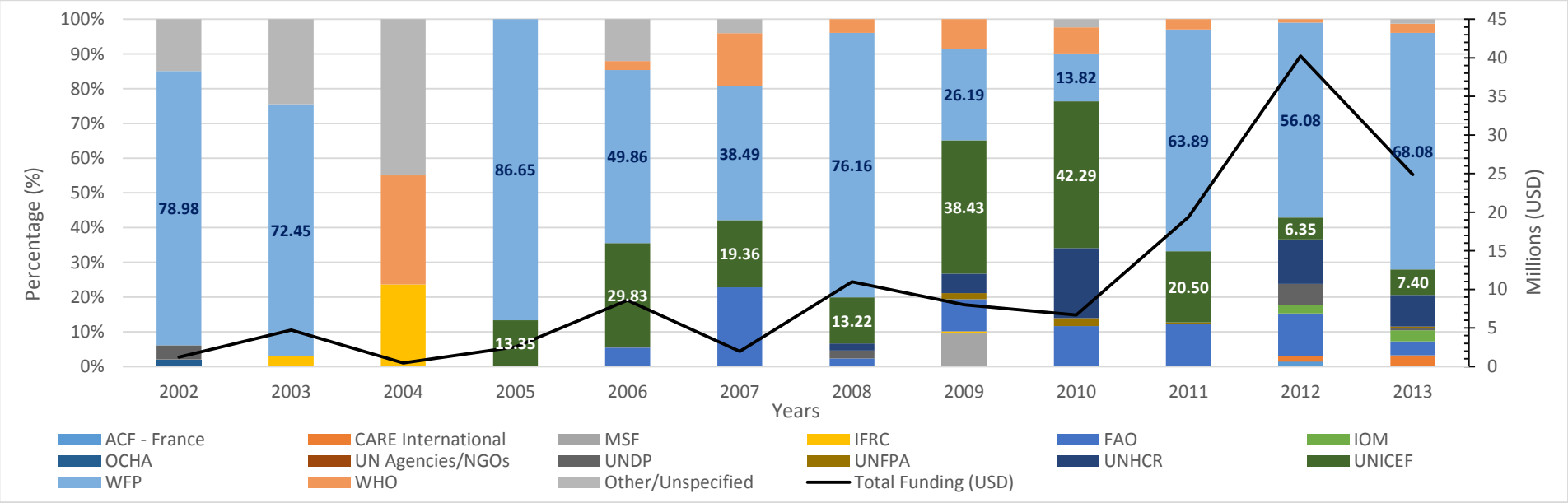
> There is only one woman (WFP) who helped us. We are alive thanks to this woman. We all wait for her, with our plastic bags, regularly, until the day she arrives and brings food. But right now it's hard because she hasn't come back in three months. The teachers told us that they are here only to teach us, the military said that they are here to protect the border. They said that they couldn't help us. Take your phone and tell them we are suffering. We don't know what we have, we cough and that's because of the cold." *(SI4, 2012)*

**Figure 8.5 Cumulative humanitarian financial contribution obtained by agency in Djibouti from 2002 to 2013 (%)**




*Source: Author's research (data were obtained from the Financial Tracking Service (FTS) database)*

**Figure 8.6 Yearly humanitarian funding by agency in Djibouti (2002-2013)**




*Source: Author's research (data were obtained from the Financial Tracking Service (FTS) database)*

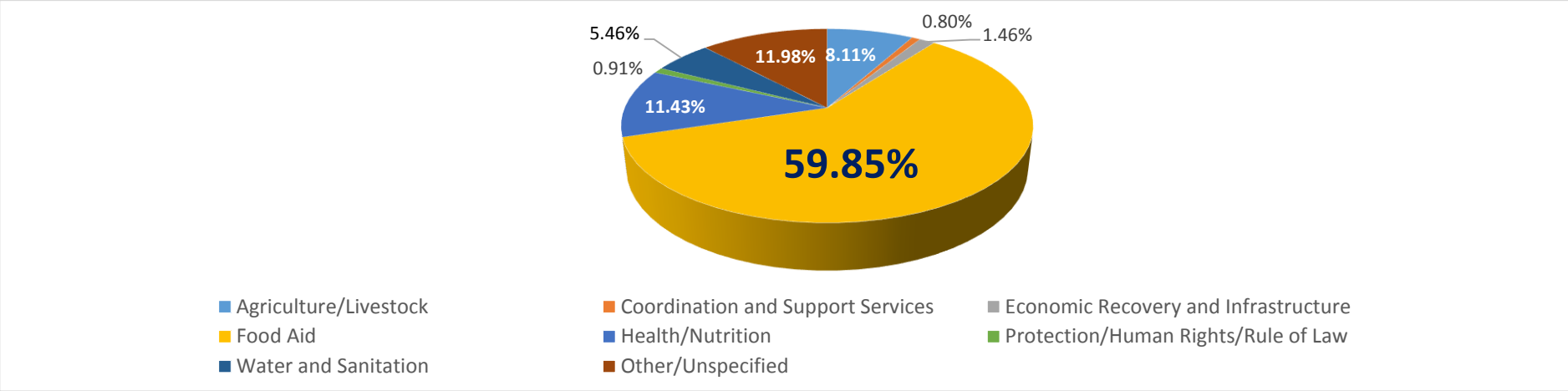
> "Before, we used to have possessions. We could buy and drink milk but when all was gone, we didn't know what else to do. We had a lot of cattle (until 100) but the drought finished it all. Now, we can't do much, only WFP can help us. The government doesn't help us. WFP gives us flour (*diqiiq*), rice (*baris*), oil (*saliid*), half in quantity for each (nus nus). They give one whole of each shared between two houses." *(SI7, 2012)*

Data gathered from other sources during the fieldwork period basically found that to a large extent, rural Djibouti as a whole has become dependent on food aid. The centrality of food assistance for rural Djiboutians today was evident from the presentations made at a Disaster Risk Management Project event held in in Djibouti city on October 23rd 2013. The broad outlines of the food programmes were confirmed during informal discussions with a WFP official. According to him, villages in all rural areas received regular food distributions. The only areas that did not receive such foods were the urban areas of Obock City, Tadjourah City, Dikhil City, Ali-Sabieh City, Arta City and Djibouti City.

Usually, all food rations were concentrated at an established distribution point (usually at the centre of the village) by WFP personnel and then they would leave. Afterwards, a designated community delegate or authority (usually the village chief) was in charge of sorting out the quantities to be allocated to villagers. Unfortunately, it was not possible to attend a distribution event in the villages to determine the adequate sharing of food between every two families.

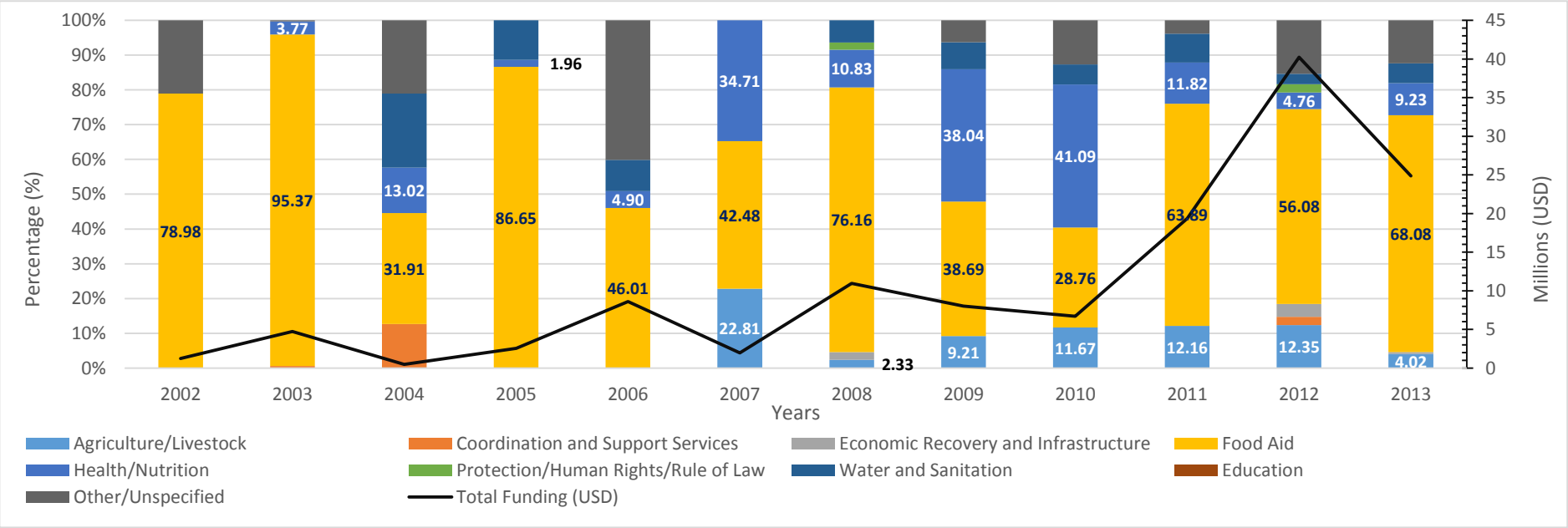
Once used to feeding themselves autonomously by various uses of their livestock, at the time of data collection households were thus largely at the mercy of food assistance programmes. Between 1988 and 2010, emergency food aid had increased worldwide from 15% to 71% (Margolies et al. 2012). According to Figures 8.7 and 8.8, the great majority of humanitarian funding secured for rural Djibouti from 2002 to 2013 was in the food aid sector at 59.85%. As mentioned by SI7 above, food rations targeted at those most vulnerable households comprised *diqiiq* (flour) and *baris* (rice) of one kilogramme (kg) each and a bottle of *saliid* (oil) for a month. To have a better appreciation of the meaning of these quantities, it was compared to other data sources.

**Figure 8.7 Cumulative humanitarian financial contribution by sector in Djibouti from 2002-2013 (%)**




*Source: Author's research (data were obtained from the Financial Tracking Service (FTS) database)*

**Figure 8.8 Yearly humanitarian funding by sector in Djibouti from 2000 to 2013**




*Source: Author's research (data were obtained from the Financial Tracking Service (FTS) database)*

According to Table 8.9, the numbers obtained through our fieldwork are slightly inferior to the minimum ration quantities required in rural Djibouti. Another factor to be included is the traditional custom of sharing between households whereby the function of the group is to provide for the needy. Respondents said that when the first few families arrived in the study sites a few decades ago, food rations were distributed separately to every household. Increased vulnerability in the face of 'normal' drought events and dry periods, livelihood change and the sedentarization process of nomadic pastoral households led to demographic growth in villages which should have led to a re-evaluation of the proportion of vulnerable households to be targeted. However, as the number of settlers rose in the study sites over the recent decades, the proportion of targeted households did not follow that increase. Since pastoral life is traditionally based on affinal and agnatic ties between different households, there is immense solidarity between households and so the villagers did their best to share the food there was. During fieldwork, respondents indicated that rations were often shared between two or more households.

**Table 8.9 Quantity and nutritional content of food rations**

| | **Food rations distributed in rural Djibouti** | | | | **Minimum energy requirements for rural Djibouti** | |
|---|---|---|---|---|---|---|
| **Sources** | Piguet, 1998, p.209[65] | WFP, 2007[66] | WFP, 2008, p.37[67] | Fieldwork in Sankal, 2012 | FAO for 2006-2008[68] | WFP, 2008, p.37 |
| **Food aid** | 500g of food/d; 1800 kcal/d | 962g of food/d | 278g of food ; 1071 kcal/d | 500g of food/d | 1830 kcal/d | 555g of food/d; 2142 kcal/d |

*Source: Author's research, 'd' means day and 'kcal' stands for kilocalories*

Including the fact that households always tend to share with relatives excluded from the beneficiaries list, self-evidently, given the extreme food deficit situation present in these villages, every respondent in all study sites declared that these quantities were far from being sufficient. Table 8.9 also indicates that not only are the amounts insufficient in terms of caloric value to maintain health, but they do not provide a sufficient range of nutrients (about 1071 kcal/d on

[65] Piguet's numbers are averages for the Horn of Africa region.
[66] Numbers emanate from a Table obtained from the WFP in 2012.
[67] These numbers correspond to ration contents for the Southeast livelihood zone (which includes parts of Ali-Sabieh region and the southern extremity of Dikhil region) from June 2008 to February 2009.
[68] Numbers emanate from a Table obtained from the FAO in 2012.

average in 2008). This additional problem was also discussed at the DRR event, when a nutritionist from the NGO Johaniter demonstrated the nutritional imbalance in the rations. Respondents themselves say that the WFP's food 'calms their hunger but does not feed them' meaning that after they consume it, they still feel weak.

A study by Asfaw et al. (2011) in rural Ethiopia showed that food aid had a positive effect on poverty reduction by helping benefitting households to mitigate impacts from shocks. On the contrary, our field study results are in line with other authors' remarks (Little et al. 1999, Ayantunde et al. 2011) that pastoralism is increasingly associated with food aid dependency. Ethnographic work suggests that after decades of depending on food aid especially in Sankal and Bondora, households were as poor and vulnerable as when they had arrived if not worse. However and as indicated by Margolies and Hoddinott (2012), it was found that Bondora and Sankal households were a lot more dependent on food aid than Koutabouya, Hanlé 2 and Dadahalou households because of the quasi-absence of livelihoods despite the relative irregularity of food assistance. As a result, it is probable that community vulnerability profiles in Bondora and Sankal remained the same or deteriorated over the years. Malnutrition, human diseases and chronic fatigue spread and were reinforced by the omnipresence of unsafe conditions. As confirmed by other studies (Aregu et al. 2007, Asfaw et al. 2011, Combes et al. 2014) life-saving measures and emergency responses act as a 'band-aid' solution which addresses the 'symptoms' rather than the 'disease' itself.

Beyond these short-term solutions, respondents indicated that they were in dire need of rebuilding their livelihood and/or switching to an alternative one as a social safety net with the assistance of relief organisations. Bondora and Sankal households in particular emitted the desire to learn cultivation methods to gradually build up a livelihood that could break their dependency on food aid for survival. In line with this mode of thinking, the WFP is now trying to invest more into Food-for-Work (FFW) and Cash-for-Work (CFW) programmes where participating pastoralists learn new skills, improve their living environment and decrease potential dependency on food aid through the construction of social infrastructure such as roads linking their village to Dikhil city.

On the other hand, school feeding centres did have a short-term beneficial effect on rural households by alleviating pressure on active and/or productive household members. Respondents indicated that schoolchildren did not need to be fed as much as other children since they ate at school. In addition, many households cited school proximity as a reason to not move from the village even though women reported covering very long distances to fetch water outside of the village. According to certain authors, there is still inconclusive evidence concerning the causal relationship between school feeding and school attendance (Margolies et al. 2012).

However, it is contended that school attendance may not be beneficial for pastoral families who still own a substantial amount of animals. Firstly, it is not needed for the effective practice of pastoralism and secondly, it represents an incentive for families to settle when in fact they should be encouraged to keep on rearing animals and herding. In the long run, their effects are rather mixed. On one side, the existence of school feeding centres is definitely a good thing for villages such as Sankal and Bondora where school education represents a viable adaptive strategy for the household in a context as urbanized as that of Djibouti. The other side of the coin is that if the school's food resources shrink as it was the case in the late 1980s at Katilu (Little et al. 1990), then parents would fill the gap with their own resources which might result in children's diets decline. This risk leads back to the food aid dependency problem discussed above which requires rural households to acquire more autonomy in ensuring food security without relying support for food from the outside.

All in all, this sub-section showed the inadequacy of the humanitarian response being implemented in rural areas to address food insecurity risk both from a disaster management perspective and from the inherent imbalance of food rations. At the DRR event, the author made a key one-hour presentation about the results from the participatory evaluation analysis completed in Hanlé 2, Koutabouya, Bondora and Dadahalou and insisted on the inadequacy of the responses implemented in rural areas to reduce human vulnerability to drought. The argument was that there were no initiatives aimed at rehabilitating and/or reconstructing rural livelihoods to re-establish some pride, autonomy and the ability of rural households to subsist on their own.

## 8.6 Conclusion

This chapter discussed the nature of the associations between livelihood change, sedentarization and vulnerability. Settling evidently contributed to an increased concentration of pastoralists in settlements which was shown to increase infection and propagation risks among the community, including tuberculosis and colds, in addition to a decrease in their nutritional status. At the same time, increased morbidity also participates in increasing the risk of malnutrition. It was shown that sedentism was associated with dietary differences between nomadic communities and sedentary ones.

The major changes included increased reliance on purchased foods and less milk intake which is rich in protein and important for child growth. One additional factor specific to the study sites is that there was a severe lack of healthcare services whether it was in the village or even in Dikhil city. The CMH lacked personnel, beds, hygienic locals, ambulances and medicine. As a result, even though pastoralists benefited from treatment at the clinic free of charge, not much could be done to treat them. In addition, health risk increased with emotional drainage linked to livestock loss and failure to get back to nomadic life. Yet, a more in-depth study is needed to determine if rural households from the study sites exhibited immune system deficiencies due to livelihood change related stress.

Given these elements of vulnerability (increased morbidity and malnutrition) and unsafe conditions of living in the face of drought impacts, it was found that most of the coping strategies used by respondents had a direct impact on their daily food intake. Most were reluctant about selling livestock and/or assets because of the disadvantageous terms of trade. Most households managed to eat at least something every day, although there were a few in each site who ate nothing on some days in each week; this was particularly serious in Bondora.

A highly significant finding was that the nomadic pastoral production system seemed more effective in both wet and dry years than the sedentary system, whether it is agro-pastoral or fully agricultural. These findings resonate with the discovery that the transhumant/semi-nomadic

pastoral livelihoods found in Koutabouya were more reliable than the agro-pastoral livelihoods found in Hanlé 2.

Overall though, respondents reported suffering a lot more since they have settled and indicated receiving very little or no help from the government. The most visible intervention reported by respondents was the WFP's food assistance. However, this emergency intervention has been going on for the past two decades while pastoral livelihoods have been slowly disappearing in rural areas. Even though food assistance saves lives on the short term, there is dire need for programmes aimed at rehabilitating and/or reconstituting rural livelihoods for rural pastoralists to regain control over their lives. Some of the solutions recommended are discussed in the next chapter.

# 9 Conclusions

## 9.1 Introduction

This study set out to uncover the social-environmental elements of vulnerability behind the occurrence of food crises in rural Djibouti. Recent years signalled alarming signs of chronic food insecurity in rural Djibouti and East Africa which were often attributed to the increased occurrence of droughts in intensity, frequency and/or duration. This claim which was found to be overwhelmingly accepted in Djibouti, was revisited in this study. More precisely, the dissertation proposes a coherent social-environmental explanation of vulnerability to droughts in rural Djibouti through both historical analysis and applied fieldwork in Sankal, Hanlé 2, Koutabouya, Dadahalou and Bondora villages. The analysis of this production incorporates temporally and spatially connected elements responsible for upsetting the balance between sustainable pastoralism practice and the preservation of ecosystem services. As stated in Chapter One, the study sought to answer one main research question which was formulated as follows:

- What are the social-environmental elements involved in the production of rural vulnerability to drought in Djibouti?

To answer the overall research question stated above, the study was guided by five research sub-questions:

1. What are the root causes of change in the pastoral landscape responsible for giving rise to vulnerability in rural areas of Djibouti?
2. What are the dynamic processes involved in reinforcing the effects of root causes on rural vulnerability through time and space?
3. What are the main unsafe conditions within which human vulnerability to drought is expressed in rural areas?
4. What is the nature of pastoralists' current vulnerability and adaptive capacity to drought?

5. What are the climate dynamics behind the occurrence of droughts in Dikhil region?

To address these questions, the study relied on the collection of secondary and primary data/information in relation to food (in)security, vulnerability elements (past and present), historical processes of institutional and environmental change and adaptive strategies employed by rural pastoralists to deal with those changes in the face of recurrent droughts and dry weather periods. This chapter draws on the body of research and findings discussed from Chapter Four to Chapter Eight.

Through the discussion of the study's empirical and theoretical findings, this chapter also intends to show that significant contributions were made to the existing literature on pastoral livelihoods in sub-Saharan Africa, East Africa and Djibouti. It is the first in-depth study made on rural vulnerability to drought in Djibouti and therefore offers a fresh and new outlook on rural vulnerability creation in the face of droughts among other studies completed in neighboring countries. More precisely, this overall research echoes the following quote that dates back to 1976:

> "The increased vulnerability of people to extreme physical events can be seen as intimately connected with the continuing process of underdevelopment." *(O'Keefe et al. 1976)*

To demonstrate the validity of this quote in accounting for the materialization of rural food insecurity risk, this chapter firstly discusses the empirical findings of this study to disprove three main food insecurity myths[69] related to rural pastoralists' responsibility with regards to land degradation, the effects of economic integration on pastoral livelihoods and the role of drought in driving rural food insecurity. Secondly, the chapter discusses the theoretical findings that emerged from the application of the Pressure and Release (PAR) model and their policy implications for intervention in rural areas. Thirdly, the chapter identifies the main limitations of the study and avenues for further research are suggested to build on the findings extracted from this present study. Overall, the chapter demonstrates that rather than drought itself, the permanency of rural

[69] The expression "food insecurity myths" is inspired by Moseley (2012)'s article on "famine myths" about the 2011 hunger crisis in the Horn of Africa.

food insecurity is linked to increased rural vulnerability of pastoral households to 'normal' droughts and *jilal* periods.

## 9.2 Empirical findings: three food insecurity myths debunked in rural Djibouti

### 9.2.1 First myth: rural pastoralists are responsible for land degradation

In light of Rabeh's vision of the "nomad mentality" mentioned in Chapter Seven, this study disagrees with the general preconception of policy-makers (Hesse et al. 2006) that pastoralism is a primitive land-use system out of synchronization with environmental fluctuations. Although this synchronization premise behind the balance of forage availability and animal needs in fodder and water is true and constitutes a natural check on both human and animal growth, the explanation offered to justify the disappearance of pasture lands concomitant with the desertification process is erroneous. Indeed, Scoones (1995)'s analysis of the ecological debate suggests that this claim is most unlikely since livestock population rarely reach levels that could cause irreversible damage. In line with this thinking, this sub-section absolves the accusation that rural pastoralists are responsible for land degradation and the desertification process observed in rural areas.

This research found that the environmental context of Dikhil region tallies well with the characteristics of a non-equilibrium environment as identified by Ellis and Swift (1988) in terms of the unpredictability of precipitations, temperature, humidity levels and associated ecosystem services. Yet, Chapter Six clearly showed that there is a seasonal cycle in the occurrence of rainfall which has persisted to the present day. Therefore, this study's findings concord with the position discussed in Vetter (2005)'s article that even in non-equilibrium environments, there is a sense of equilibrium between natural resource consumption and the provision of ecosystem services maintained by the presence of natural checks on both human and animal numbers. As confirmed by respondents themselves in Chapter Six, the corollary of such a finding is that pastoralists were able to more or less predict the occurrence of rainfall and therefore the regrowth of pasture lands in a timely manner. It was on this basis that pastoral transhumance and nomadic routes were established. However, the main challenge resided in the *spatial* unpredictability of rainfall which

required pastoralists to regularly send out scouts in search for suitable grazing areas. These environmental features of temporal cyclicality and spatial heterogeneity of rainfall patterns found in rural Dikhil region were assumed to be already present two hundred years ago.

To understand how the sustainable practice of pastoralism was first upset, it is necessary to go back in time. With the Berlin Conference of November 14th 1884, the formal scramble for Eastern African lands was launched. The contact between Europeans and the indigenous expressed itself through a confluence of contradictory meanings, both on the environmental and social levels, laying the ground for a three-step process in upsetting the pastoral system.

- *Confrontational meanings and perceptions over productive land-use*

The first step was a confrontation in systems of imagination and meaning between Westphalian ideas of self-determination and sovereignty over the land and the indigenous social-environmental contract regulations of the *isso* and *wano* (Afar) and *Xeer* (Somali) described in Chapter Four. Before the arrival of the Europeans, Afar territory was already conceptually partitioned and assigned to different tribes/clans and tribal/clan land was allocated to individual families which therefore meant that land ownership lied within these respective families. For the Somali-Ise, land was seen as belonging to no one and accessible to all. Although Afar society was sensibly more structured in western terms than Somali society, power was well distributed among the different family heads, tribal/clan leaders, Afar sultans, and the Somali-Ise *Ugas*. Contrary to European countries at the end of the 19th Century, power was not centralized at higher hierarchical levels among the indigenous. Through the signature of various treaties with other Europeans and with the leaders of both ethnic groups, the French established national borders and internal administrative boundaries regardless of indigenous family ownership by assigning fixed grazing lands to pastoralist communities. Their triumph signalled the demise of pastoralism for those contained within the boundaries of Djibouti. Added to the founding of Djibouti City as the main economic and political centre and the bribery of various chiefs, western views about productive land-use, organisation of social life and allocation of power were to take hold. It led to the establishment of formal statutory bodies and "legal pluralism" (Nori et al. 2008) with regulations over-lapping with those dictated by informal customary institutions.

- *Space restriction and man-made resource scarcity*

The second step corresponds to the after-effects of these signed treaties which were multiple and social-environmental in nature. Greater military power allowed the French to implement their version of a nation-state. Since pastoral mobility and indigenous land-use practices were seen as a threat to established order in the colony, the colonial administration failed to take note of the environmental determinism in the social co-construction of pastoral life. It led to the establishment of borders, administrative boundaries and the 'Conseil Représentatif' in Djibouti city to divide, subdue and eventually control the indigenous. As seen in Chapter Four, border-making by Western powers in the scramble for Eastern African lands resulted in entire tribes having their grazing lands and transhumance routes spread over two and even three different States. Later, the birth of the railway impacted the once significant role of ancient commercial routes usually taken by nomadic caravans as an opportunity for pastoralists to complement their heavily livestock based diet with carbohydrate-rich foods. Traditional centres like Tadjoura and Ambabbo witnessed their commercial networks gradually diminish in importance and attractiveness and new centres like Dikhil city gradually grew in importance.

As seen in Chapter Four, at first, tensions arose between Afar tribes not because of resource scarcity for livestock consumption but rather due to the containment and constraining of nomadic ethnic groupings. At the same time, containment of nomadic groups was also concomitant with concentrated herding and increased and more permanent stocking pressure over pasture lands. Herd accumulation was an inherent feature of pastoralism to buffer unexpected environmental fluctuations and was limited and 'controlled' by natural checks on livestock numbers. It was practised over extensive areas by nomadic groups without necessarily affecting the long-term fertility of pasture lands. Consequently, the overgrazing problem was not caused by herd accumulation but by *space reduction* for its practice by regulatory policies and land attribution rights arbitrarily put in place by the colonial administration.

Further, pastoral containment procedures were applied on rural areas dominantly constituted of summer pasture lands (see Figure 4.6) which, contrarily to refuge pasture lands, needed time for regrowth with the application of rules of *mise en défens* on certain areas to preserve their long-

term fertility. Evidently, all pastoral needs could not be satisfied and therefore the conflict rate rose. In fact, the more regulations and sanctions the administration applied to land-use in rural areas with the arbitrary assignment of certain lands to certain tribes and forbidding others from trespassing, the more tension was created. The more regulatory were the land-use rules implemented by the colonial government, the lesser control the central administration had on nomadic groups. Eventually, diminished mobility, demographic growth and the 'normal' occurrence of periodic droughts and dry periods led to growing resource scarcity for livestock and rural households.

Thus and as discussed in Chapter Four, resource scarcity was not natural but *man-made* and participated in affecting the authoritative legitimacy of traditional systems of conflict and land management. As already recognized by Kirkbride and Grahn (2008), it is spatial distribution of livestock rather than their number that needed to be managed to avoid overgrazing of the land, thus underlining the critical importance of mobility in dryland resource management. Natural checks on both human and animal numbers included disease occurrence, periods of food scarcity alternating with times of plenty, rainfall fluctuations and unpredictable availability of pasture. As western powers constrained the environmental requirements for the sustainable practice of pastoralism, households' livelihoods were rendered more exposed and more susceptible to these natural checks. Although there is no data to prove this directly, it is deduced that food insecurity was already an emerging issue at that time and thus justified the policies implemented by the colonial administration.

- *Natural checks, sedentarization and land overexploitation*

The third step in upsetting the traditional pastoral system comprises the policies discussed in Chapter Seven and implemented to resolve pastoral resource scarcity in an attempt to address resource competition and the eruption of conflict. Since at the time the factors of environmental degradation were mainly seen as natural and the dominant geographical perspective was mostly positivistic rather than the ensuing humanistic perspective described in Chapter Two, the central administration in Djibouti city intended to fill the resource gaps of pastoralists' livelihoods with technology, namely the implementation of various projects facilitating their access to water and

livestock trade. These technological responses to the problem reflected a development model imported from temperate grasslands and stable conditions of North Amercia (Kirkbride et al. 2008). It also meant that contrary to current perceptions prevailing in Djibouti, the sedentarization process already started back in the 1900s with the construction of water points, the completion of the railway and the establishment of market centres in rural areas such as in Dikhil city. Although sedentarization was rather seen as a dynamic pressure in this research on the production of vulnerability through time, its beginnings were considered as belonging to root causes in triggering many environmental after-effects impacting the pastoral system. The construction of roads, transportation networks, administrative posts and water points and the availability of veterinary services encouraged the sedentarization process of the early 1900s.

Herders thus started practising an incomplete form of transhumance. As the French attempted to solve resource scarcity and settle land disputes with engineering works, natural checks on human and livestock populations were more or less removed. As a result, human and animal numbers increased in constrained spaces. As both summer and refuge pasture lands (especially those of Agoa and Kalo in Dikhil region) shrunk in cover, transhumant herders needed to practise a more extensive type of pastoralism, covering greater distances than before while their families, settled, would be left behind in villages. Consequently, the policies meant to address resource scarcity actually *reinforced* the process of environmental degradation and resource scarcity. In addition, in light of the tight inter-relationships that exist between land cover and atmospheric processes described in Chapter Six, internal feedback loops may have been triggered and participated in increasing the desertification process.

This sub-section sought to disprove the claim that the practice of pastoralism and more precisely herd accumulation was responsible for the present state of land degradation and desertification visible in rural areas and reported by respondents in all study sites. Rather, a range of sequential root causes including space containment for the practice of pastoralism, power migration from within indigenous communities to Djibouti city and the removal of natural checks on both human and animal numbers combined to give rise to rural household vulnerability. These factors affected the allocation and distribution of resources as well as pastoralists' access to it. Eventually though, given the absence of private property systems in rural areas, it led to the decreased availability of

pasture and water for livestock consumption. As discussed in Chapter Four, in light of the tight connection that exists between the 'social' and the 'environmental', environmental changes brought about by root causes provoked deep social changes among pastoral communities. These are discussed in the following sub-section on the effects of Djibouti's economic development on pastoral livelihoods.

### 9.2.2 Second myth: Djibouti's economic integration was beneficial to rural livelihoods

The previous sub-section discussed the role of competing systems of signification as the source of incoherent policies implemented in the acquisition of the colonial territory of Djibouti and the control of the indigenous contained within its borders. On the eve of Djibouti's independence, contradictions borne out of the colonization process remained and were reinforced through institutional change. This sub-section discusses the dynamic pressures in reinforcing the effects of root causes as a response to the second research sub-question of Chapter One. It includes a discussion of the nature of the effects of Djibouti's progressive entry into the world economy and the effects of its steady economic growth since the 1990s on rural livelihoods.

Djibouti's access to its independence from France's colonial grip is imbued with many meanings. The years prior to the country's independence were marked by a series of institutional changes, social-political strife between the Afars and the Somalis and the gradual conditioning of political leaders of both ethnic groups into accepting and integrating the Westphalian ideas of state sovereignty over the land, its resources and the people contained within national borders. At that point, the socio-political and economic centre of the colony was in Djibouti city and therefore its internal affairs and political future was directed there. From a political ecological perspective looking at power relationships with regards to resource access, the communities' control over pastoralism which included traditional land management, mobility of rural households, customary rules of livestock exchange and conflict management, was hijacked. As discussed in Chapter Five, the imagination of pastoralists was being changed to a point where, because of less exchange with their indigenous neighbours in Ethiopia, Eritrea and Somalia combined with the centralization of power in Djibouti City, the nomads progressively realized and understood that their survival was conditioned upon their participation and integration into urban life, the locus of political power

and recognition. As their sense of collective identity and historical background made them the rightful indigenous members of the colony, they rightfully felt that it was their right to participate in directing the course of the political tangent of the colony in accordance with the French administration's wishes.

As the right to self-determination was transferred to Djiboutian leaders led by Hassan Gouled Aptidon in 1977, a societal dichotomy was suddenly reified with legal recognition of the State's endowed legislative and executive powers. There were now two worlds at odds with each other, with competing systems of signification and contradictory imaginary landscapes. Competition over resources and national aspirations of the governments of Djibouti, Ethiopia and Somalia fed regional tensions and conflict between the Afars and the Somali-Ise. Combined with migratory flows from rural areas to the city, these pressures have redefined their pastoral imagination and encouraged them to enter into modernity. Thus the research found that rural migrations to urban centres (which was already taking place during the colonial period) were reinforced, including the sedentarization process in the villages created during the colonial period such as in Bondora, Sankal and Hanlé 2.

Independence had two main implications. Firstly, those generations which have grown and lived in urban centres (especially in Djibouti city) developed a vision of modernity and economic progress alien to traditional values of prestige and success proper to the pastoral system and dominant in rural areas with the concomitant entry of Djibouti into the world economy. Secondly, the independence of Djibouti also signified that the State took over the responsibility of funding the country's development. As mentioned in Chapter Seven, pre-colonial times witnessed the role of tribal solidarity as a powerful protective asset in nomadic societies surviving in an environment where many natural livelihood-related components were ephemeral. Indigenous entities such as the *Fi'ma* for the Afars and the *Gendi* for the Somali-Ise made sure the group provided for the needy. With the advent of Djiboutians' auto-determination, the State was to provide for the needs of its population, urban and rural households alike. However, although the State was endowed with both legislative and executive powers without interference from France, its empty coffers meant that it was incapable of funding any development initiatives. The research thus found that not only were rural communities deprived of the right and power to administer the land for the sustainable

practice of pastoralism, but the weak centralized Djiboutian state inherited from the colonial process did not have the means to address any of the pressing issues of the day, including high unemployment rates in urban areas, lack of skilled labour and more importantly, rural livelihood loss and environmental degradation.

Chapter Five showed that within two years of Djibouti's independence, the government signed financial agreements with multilateral agencies and became a member country of the International Monetary Fund (IMF) in 1978 and the World Bank (WB) in 1980. The nature of the financial regulations and structural adjustment policies (SAPs) included government fiscal adjustments, wage restraint, spending cuts, trade liberalization and privatization of state enterprises such as Djibouti's Port, airport and others. This research found that a very limited number of development initiatives, financed at 75% by multilateral loans with interest, actually aimed at reconstructing rural livelihoods between the 1990s and 2012 and reversing the rate of environmental degradation reported by respondents. As a corollary, the stringency of regulatory measures imposed on the Djiboutian economy translated into a progressive displacement of the economic power in decision-making from the State to these international banking institutions. The implication of this is an unfortunate and ever-more elongated thread linking the natural basis (pasture land and water resources) for the sustainable practice of pastoralism with herders' power to control the way natural resources were used and regulated in the face of environmental fluctuations.

Chapter Five also showed that despite the country's steady economic growth since the 1990s (excluding the 1993-1995 period marked by the FRUD rebellion's detrimental effects on the economy), Djiboutians are now more indebted than ever. Further, as quoted in two IMF documents from Chapter Five, the considerable increase in the inflow of foreign direct investments and the strengthening of Djibouti's geopolitical position as a regional hub were of little benefit to rural households. Rather than investing in the weak primary sector represented by livestock, agriculture and environmental services, the government invested (and continues to invest) massively (75% of the budget) in the tertiary sector and especially Port infrastructure and services where the dividends are the greatest. A great portion of these returns was (and is) dedicated to paying back the interest on bilateral and multilateral loans contracted by the State while the rest was barely sufficient to remunerate the workforce. As a result, since the government had no public funds to finance

development projects, no such initiatives were undertaken unless external financing was available and whose interests would be paid back by the Djiboutians themselves.

Chapter Five further showed that there were limited investments in re-establishing and strengthening pastoral livelihoods. That was partly due to the fact that existing national statistics are inadequate and inaccurate in boasting the merits of pastoralism as a potential income source from tourism, sustainable land use and risk management in a non-equilibrium environment and biodiversity conservation (Hesse et al. 2006). As shown in Chapter Five, the State therefore undervalued pastoralism and preferred investing in the third sector to guarantee its ability to respect payments on loans contracted from both bilateral and multilateral lenders. Consequently, pastoral communities were found to be marginalized on the basis of their geographical remoteness, and their livelihood type which was (and still is!) seen as outmoded, primitive and antithetical to modernity. As indicated by Devereux (2006), Djiboutian state officials share the same opinion as those of many technical experts and some policy-makers who foresee no future for pastoralism and that a transition to sedentary life is required. The only occasional initiatives by the State built on previous engineering works by the Colonial administration, namely building wells, boreholes, solar panel installation, schools and certain roads and tracks to facilitate transportation and access to certain villages.

As discussed in the previous sub-section, this line of thinking and the initiatives described only reinforced the unintended detrimental effects on the environment by favouring the sedentarization of nomads, pushing herders out of pastoralism. This was exemplified at length in Chapter Seven where the configuration of Hanlé 2, Koutabouya, Bondora and Dadahalou exhibited settlements established close to schools and wells built by the government. As stated by respondents in Bondora, the sedentarization process and demographic growth exploded after the independence process during the 1990s. In addition, Chapter Five showed how the marginalization of rural pastoralists was reinforced with no representatives participating in the decision-making process with regards to the nature of development projects to be implemented or the accords signed with international financial institutions in tackling poverty in urban and rural settings. As a result, the combination of these pressures forced rural households to reconfigure their diminishing livestock profile and to diversify their food and income sources. Because of the reasons mentioned above

and the gradual loss of livestock without any strong alternatives present in rural areas, respondents viewed sedentarization as a pauperization process with greater exposure of rural households to both price and environmental fluctuations, and the spatial unpredictability of rainfall, pasture land growth and water availability.

This sub-section showed that Djibouti's access to independence and entry into the world economy was not beneficial to rural pastoralists. Firstly, this entry took place subsequently to failed attempts by the colonial administration to commercialise livestock in an environment mainly constituted of summer pasture lands and occurred regardless of rural pastoralists' aspirations and difficulties. Secondly, as Djibouti became independent and obtained financial help from international institutions, its economic policies became increasingly influenced by the IMF and the WB. The directives implemented under their guidance did not decrease the vulnerability of pastoral livelihoods. On the contrary, secondary and primary data collected for this research show that rural pastoralists were marginalized, their needs ignored and livelihood losses not addressed. The findings of this sub-section thus concur with other studies' findings (UNOCHA-PCI 2006) in the Horn of Africa that the underlying causes of vulnerability in rural Djibouti are social and political in nature rather than natural. These dynamic pressures had important repercussions on pastoralists' vulnerability and capacity to ensure household food security.

### 9.2.3 Third myth: drought is responsible for current rural food insecurity

This sub-section investigates the overwhelming claim reported by humanitarian and government officials alike in Djibouti and abroad that drought is the hazard responsible for undermining food security in rural areas. To make sense of the primary and secondary evidence found through this research, three interlinked research sub-questions were addressed. This sub-section discusses the results obtained from the analysis of rainfall data in the last four decades, the nature and role of unsafe conditions of living, and their effects on pastoral vulnerability to drought.

As stated in Chapter Two and shown in Figure 9.1, the PAR model was used to uncover the social-environmental variables involved in the production of vulnerability to drought. However, to understand the interplay between food insecurity/famine, drought, household vulnerability to it

and its capacity to buffer its effects, it is necessary to refer back to the disaster risk equation discussed in Chapter Two. As a reminder, the equation read as follows: R = H x V/C, where 'R' is disaster risk (such as food insecurity or famine), 'H' is the hazard (such as drought), 'V' is household vulnerability to it and 'C' is the adaptive capacity of rural households in the context of drought. Each of these elements are reviewed and eventual connections between them are drawn to better understand their respective contribution to the problematic studied in this research.

The analytical results of Chapter Six represent a significant milestone for the understanding of climate patterns in rural Djibouti as it is, again, the only study completed on the subject with Ozer and Mahamoud (2013)'s climate study in Djibouti city. An examination of climatic variability and rainfall patterns over Dikhil region and the Horn of Africa (HoA) revealed that there was great difficulty in extracting significant trends across space and time. Over most of the HoA, Chapter Six showed that definite claims about the increased frequency and/or intensity of droughts is presumptuous for three main reasons given the amount of variation in the results obtained across different time (daily, decadal, monthly, yearly) and spatial (regional, national, district, station) scales.

Firstly, these difficulties were fed by the multiplicity of factors that drive the occurrence of drought and climate in the region, including Dikhil region in Djibouti. These included various internal and external ecosystem feedback loops between Pacific and Indian sea-surface temperatures, vegetative cover and atmospheric gaseous content, interstation data variability due to significant spatial variability in rainfall and the mere lack of sufficient rainfall data at adequate time-scales. In Djibouti for instance, it was shown that between 1990 and 2013, no rain gauge data was found for Dikhil region probably due to the destruction of various stations in the midst of the 1994 civil war. As a result, the rainfall data used for this research relied heavily on decadal and monthly satellite imagery measurements obtained from the GIEWS database.

Secondly, rain gauge measurements across Dikhil region from 1960 to 1990 and satellite imagery data from 2007 to 2013 were contrasted and showed inconclusive evidence of a downward trend in rainfall patterns. In addition, pastoralists' perceptions of meteorological drought occurrence collected through in-depth and semi-structured interviews revealed perceptions that contradicted

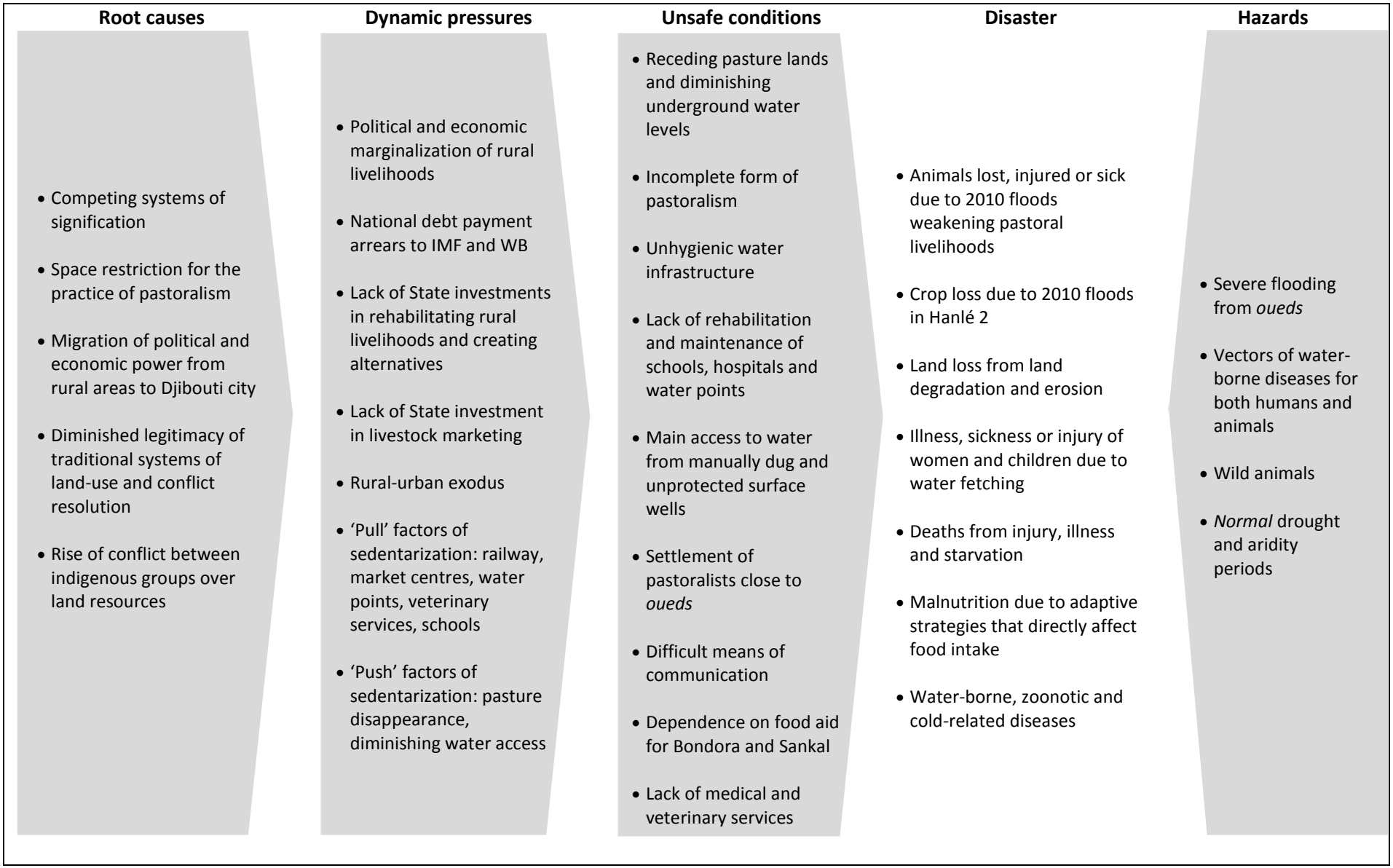
data results from other studies completed in the Issa ecosystem that rainfall had not fluctuated that much in the last 80 years. The research found that in response to the fifth research sub-question of Chapter One, these contradictions may be due to the fact that the respondents interviewed had an interpretation of the duration and intensity of drought heavily correlated with the duration of stay in the village. It was deduced that since pastoralists settled (up to seven years ago among respondents), lack of mobility explained their less accurate perception of rainfall fluctuations in the overall Issa ecosystem they used to cover as nomads.

Thirdly, contrary to respondents' statements that some had not seen any rain for a year or more, an examination of satellite imagery data clearly shows that there was no interruption in the occurrence of both the *diraac/sougoum* and *karan/karma* rains from 2007 to 2013 besides differences in year to year total precipitation. Moreover, the research found that contrary to the preconceived belief that non-equilibrium environments were characterized by unpredictable rainfall occurrence, the episodic nature of dry and rainfall seasons was clearly identified with a bimodal cycle in rainfall fluctuations over Dikhil region although great spatial variability in rainfall was also discovered.

These results enrich the literature on climate fluctuations in Djibouti (Mahamoud et al. 2013, Ozer et al. 2013) and the Horn of Africa (Segele et al. 2009, Almazroui et al. 2012) by indicating that there is no definite proof of an 'extra-ordinary' or 'abnormal' increase in the intensity, duration and/or frequency of droughts. The research thus sought for an explanation through changes in the vulnerability and/or adaptive capacity of rural households in the context of droughts. According to the aforementioned disaster risk equation, since there was no definite increasing trend observed in the occurrence of droughts, an increase in household food insecurity/famine risk could then be explained by either increasing vulnerability to its effects or decreasing adaptive capacity in times of drought and/or during the *jilal*.

In addressing the third research sub-question on the materialisation and nature of unsafe conditions and the fourth sub-question concerning the expression of current vulnerability and adaptive capacity profiles, this research found definite evidence for increasing vulnerability and decreasing adaptive capacity in the face of droughts.

**Figure 9.1 'Pressures' that result in vulnerability and food insecurity in rural Djibouti**




*Source: Author's research inspired by the PAR model from Wisner et al., 2004, p.51*

Concerning the rural household vulnerability side of the equation, as shown in Chapter Four and Five and Figure 9.1, root historical causes were involved in upsetting the sustainable balance between pastoral activities and ecosystem services whereas dynamic pressures participated in reinforcing these effects by weakening internal communities' ability to buffer, absorb and recover from drought impacts. Ethnographic work, semi-structured and structured interviews, and an analytical review of the literature on sedentarization's implications for recently settled nomadic pastoralists revealed that their conditions of living deteriorated. This research found four main reasons to account for rural households' increased vulnerability to drought.

Firstly and as shown in Chapter Seven, fieldwork in Hanlé 2, Koutabouya, Bondora and Dadahalou revealed that households' livelihoods were more or less on the verge of disappearance due to shrinking pasture land cover, diminishing water availability and quality leading to herd size reduction. Further, the PVCAs showed that the study sites exhibited weak water infrastructure in need of significant rehabilitation works which exposed villagers to water-borne pathogens and/or vectors.

Secondly and as discussed in Chapter Eight, sedentarization was accompanied by nutritional change with diminished access to nutritional foods and higher reliance on food aid. This was explained by the fact that rural households' consumed increasingly less livestock-derived products which diminished their protein intake (crucial for child growth and pregnant/lactating women) and also less plant-based foods rich in carbohydrates (energy) because of decreasing purchasing power and the concomitant rise in the price of foodstuffs described in Chapter Five. As a result, rural households become increasingly dependent on the WFP's food aid and school feeding centres.

Thirdly and as discussed in Chapter Eight, the PVCAs also generated results indicating that because of the sedentarization process and decreased mobility, rural households were more exposed to impacts from non-drought hazards on their livelihoods and themselves which included animal and human pathogens, animal attacks on livestock and floods since they lived near *oueds*. The research found that these non-drought hazards participated in increasing rural household vulnerability in times of drought and even during the normal occurrence of the *jilal*.

Fourthly, livestock loss and the sedentarization of nomadic households brought significant internal changes in labour divisions and subsequent effects on vulnerability. As shown in Chapter Eight, women and children dedicated a minimum of six hours per day fetching water and wood over great distances, including food preparation, cooking, taking care of children, cleaning, washing, making handicraft and looking after small livestock. It was found that their daily food intake was outbalanced by the amount of daily effort spent, affecting both their health and malnutrition levels. Excluding those remaining herders obligated to practise extensive pastoralism over greater distances than before, livestock-less men exhibited depressive symptoms and hopelessness as they struggled to find wage labour in the city where their skills were often not valued nor needed. As a result, this research suggests that the four main aforementioned factors combined to increase both rural households' food insecurity and their morbidity, mortality and malnutrition rates.

On the adaptive capacity side of the equation, severe changes were found. As specified in Chapter Two, this research viewed adaptive capacity as comprising adaptive mechanisms, coping strategies and adaptive strategies. Adaptive mechanisms were considered as actions inherent to nomadic pastoralism used to counter the 'normal' and unpredictable behaviour of various environmental variables and thus included livestock accumulation, mobility of households and herds, selling of certain animals to buy complementary foods. This research found that adaptive mechanisms, although still practised by transhumant herders, were less frequently used such as the movement of entire households in search of pasture lands and water sources because of the sedentarization process. Adaptive strategies (not to be confused with coping strategies) were considered as long-term responses to prolonged and/or intense impacts from stresses or shocks on rural livelihoods. The research found that the adaptive strategies opted by rural pastoralists included sedentarization, sending children to school in the villages where they settled and migration of productive members to the city in search of wage labour as an attempt to adapt to long-term livelihood change.

Coping strategies were considered as those immediate actions taken within the household to 'buffer' temporary stresses and shocks threatening household food security. Through the implementation of the CSIs, Chapter Eight showed that the array of coping strategies used by households was rather limited and tended to decrease with loss of livestock. For instance, it was found that Koutabouya households who had more surviving animals than Bondora households had

a lower mean CSI than the agro-pastoral households of Hanlé 2 and the livestock-less households of Bondora. In addition, it was globally remarked that the most popular strategies were 'consuming cheaper less preferred foods', 'reducing the quantity of food per meal' and 'reducing the number of meals per day' which directly affected the adequacy and diet of food intake.

This sub-section showed that rather than drought, rural food insecurity risk is linked to the unsafe nature of pastoralists' conditions of living which was manifested in high vulnerability - especially with regards to their susceptibility rather than their exposure - to drought and the use of coping strategies that decrease the quality of food intake and therefore reinforced their vulnerability. The research's responses to sub-questions Three, Four and Five stated in Chapter One suggest that rather than overall decreasing rainfall patterns as the main cause of food insecurity in the study sites, Dikhil region and the Issa ecosystem, it seems that pastoral households are experiencing greater difficulty in resisting, absorbing and recovering from 'normal' droughts and dry seasons. Thus, the problem behind rural food insecurity is not drought occurrence but rather increased vulnerability to it.

## 9.3 Theoretical findings and policy implications

### 9.3.1 Theoretical findings

This sub-section addresses the theoretical findings unveiled through this research. The study applied a post-structural geographical approach and more specifically a disaster risk perspective to the question of vulnerability to drought. The Pressure and Release (PAR) model was used to show that current vulnerability facets were rooted in social processes and underlying causes both remote from and contemporary to current food insecurity risk. As indicated in Rettberg's article:

> "Although a lot of vulnerability studies have dealt with the question of how people cope with risks and crisis situations, little attention has been paid to the meanings and significance of risk to local actors" *(Rettberg 2010, p.249).*

To fill the gap in the disaster risk literature mentioned in the above quote, semi-structured interviews and community-based participatory methods were used to assess the nature of hazards, vulnerability, adaptive capacity and risks from the people's perspective. Aside from the depiction of hazard and vulnerability components acting as pressuring and releasing forces determining the eventual unfolding of disaster, the results obtained and discussed from Chapter Four to Chapter Eight suggest three main contentions with regards to vulnerability.

Firstly, there is long-term vulnerability created through the unfolding of various processes which were triggered during the colonial period and maintained through institutional change. More importantly, its study revealed that contradictory imaginary landscapes and misunderstandings with regards to the workings of non-equilibrium environments in the specific context of the HoA and Dikhil region played a significant role in undermining rural livelihoods. Systems of signification over the productive value and use of ecosystem services strongly determine decision-making and policy-making, whether it is in the case of nomadic pastoralists or French governors of the colonial era. Clearly, within disaster risk studies and the humanitarian community in general, it is of utmost importance to study vulnerability from a post-structural perspective without any *a priori* ideas about the 'normal' behaviour of certain environmental variables or assumed connections between the social and the environmental.

Secondly, there is short-term vulnerability which was found to be very dynamic and complex but addressable. This immediate type of vulnerability was understood through the implementation of various participatory methods with pastoralists' perceptions at the centre of its definition to connect it with long-term vulnerability production. Fieldwork showed that emphasis must be placed on immanent critiques rather than external interpretations about the poverty of pastoralists, their unproductive use of the land and/or their reluctance to urbanize. To address the different stages of vulnerability production, secondary sources were consulted and contrasted with qualitative data obtained from in-depth, semi-structured and structured interviews. The use of the participatory tools integral to the participatory vulnerability and capacity assessments (PVCAs) methodology and the participatory process involved in the generation of the coping strategy indexes (CSIs) reflect the post-structural outlook of this research.

Thirdly and more importantly so, the understanding of both long-term and short-term current vulnerability infers that there are underlying connections between the two. These connections beyond time and space exist in a non-equilibrium environment (rural Djibouti) which actually exhibits equilibrium characteristics between the sustainable practice of pastoralism and variations in the productive capacity of the land. This research showed that current vulnerability to drought was determined by social-environmental factors at different scales, both temporally and spatially. Thus, it confirms the pre-assumptions about considerations of scale discussed in Chapter Three. The post-structural outlook on social-environmental process of vulnerability production exhibited far-flung influences (root causes and dynamic pressures) and immediate determinants (unsafe conditions) of current vulnerability to drought, a 'normal' feature of climate in rural Dikhil (Chapter Six).

Chapter Four stated that pastoralism was defined as a way of life which predominantly relies on livestock rearing and the consumption of its derived products. The use of participatory methods in 'giving a voice to pastoralists' revealed that this definition is incomplete since it excludes the pastoral conceptual landscape behind pastoralists' interpretation of the world which was found to be present in the study sites (except in Hanlé 2 where households have adopted agriculture as an ancillary activity among others and Koutabouya where households still had good surviving numbers of animals) despite the near-disappearance of livestock such as in Bondora and Sankal. This imaginary landscape, albeit deprived of its substantive basis (livestock), participated in fostering an 'assistantship' culture whereby pastoralists felt they were helpless, abandoned, and incapable of anything since they lost their livestock and their skills were not valued in the city. As a result, they lacked the will to initiate a mentality change which is usually the first sign of adaptation to environmental change before the effective implementation of adaptive strategies. One anecdote tells the story of a WFP FFW programme in Obock where rural pastoralists had to build a road that would connect their village to the main road in Obock City. Half-way through construction, the WFP experienced difficulty providing the promised rations. By the time the road was completed, the WFP had not provided the said food rations. Angered, the villagers destroyed the road they spent several months building which confirmed the fact that despite efforts spent on road construction as an adaptation strategy beneficial to livelihood change, pastoralists had not yet

gone through the required mentality change which could have made them perceive the road as a useful common asset.

The last and probably most significant theoretical finding extracted from the overall study concerns the conceptualization of drought as a hazard in the specific context of rural Djibouti in relation to elements of vulnerability within the disaster risk equation. Before embarking on this research, although the influence of social-political variables were hypothesized as participating in increasing vulnerability through time, drought was considered as one of the main contributors to the prevailing food insecurity situation endemic in rural Djibouti and Dikhil region. With the application of a post-structural geographical approach and the use of the PAR model, the research found that rather than droughts or dry periods, pastoralists' vulnerability to 'normal' rainfall fluctuations increased due to human detrimental influences on the balance between the sustainable practice of pastoralism and the durable preservation of ecosystem services such as pasture and water. Therefore, the theoretical findings are in line with the general belief in disaster risk studies that disaster is often socially constructed and arises out of social, economic and environmental circumstances of everyday life (Morrow 1999, Adger 2006, Birkmann et al. 2013a) and that therefore responses must be aimed at decreasing the vulnerability of pastoralists and increasing their adaptive capacity in the face of droughts (Sapountzaki 2012, Fekete et al. 2014, Singh et al. 2014). The corollary of this finding which is also the reason behind the choice of the title of this study, is that drought, which was recognized in Chapter Six as a natural and recurrent climatic phenomenon by respondents themselves, is a *man-made* hazard. In other words, social-political factors at the root increased pastoral vulnerability to drought to a point where 'normal' drought effectively became a hazard for settled and transhumant pastoralists alike.

These theoretical findings have both policy and humanitarian implications with regards to responses that could and should be implemented in rural areas to address vulnerability to drought.

### 9.3.2 Policy implications for intervention in rural areas

The previous sub-section enunciated and discussed the main theoretical findings that have emerged from this research. In turn, these outputs have repercussions both at the policy and interventional

level in terms of the possible responses that could address rural household vulnerability to drought. As stated in Chapter Eight, the disaster risk management cycle is generally comprised of six main stages: (emergency) response, recovery, rehabilitation/reconstruction, prevention, mitigation and preparedness. It is useful to reiterate here the theoretical finding that the main issues to be addressed in rural areas is vulnerability to drought and households' internal adaptive capacity to its effects. Although the disaster equation from Chapter Two seems to conceptually separate adaptive capacity from vulnerability, both of these elements overlap and are iteratively dynamic.

Given the drastic but progressive livelihood change rural households have gone through over the years, both policy and projects/programmes must imperatively seek to reduce households' susceptibility and exposure to drought. Chapter Eight stated that considering the long-term and rather pernicious effects of drought compared to the sudden impacts of floods or tornadoes, the research found that in the past decades since Djibouti's independence, the main type of intervention was emergency humanitarian response in various forms of food aid. In other words, despite the recurrent nature of food crises in rural Djibouti linked to the irregular occurrence of droughts which gradually eroded remaining pastoral livelihoods, households have only benefitted from food assistance which, although life-saving, did not re-establish the means for them to recover and face future droughts. Thus, these short-term emergency interventions compounded the underlying structural problem. As a result, rural households were (and are still) experiencing a chronic state of vulnerability to drought.

This study rather encourages the making of policies aimed at long-term development interventions. These interventions should address the underlying elements of pastoral vulnerability by helping rural households to rehabilitate their livelihoods and/or create sustainable alternative sources of livelihood. In light of the indirect impacts of engineering works (building of water points, commercial centres and schools) in fuelling the sedentarization process described in Chapter Seven both during the colonial period and in the last three decades, the question that comes to mind could be formulated as follows: What sustainable interventions could be implemented to lower rural households' vulnerability to drought?

Considering the theoretical findings identified in the previous sub-section, the answer lies in the question itself. Today, there are two contradictory worlds at odds with each other. On one hand there is the world of rural pastoralists, with their traditions, customary rights, values and perceptions of the land. On the other, there is the reality of an urban world, with its set of rules, law and order, and openness to the opportunities offered by the modern economy. There needs to be a common ground for both imaginary landscapes about pastoralism. As formulated by Scoones and Graham (1994), policy-makers and humanitarian actors must realize that rural Djibouti is dominated by highly variable rainfall and episodic droughts. Since Chapter Two and Four showed that herding is a livelihood well adapted to the semi-arid conditions prevalent in Dikhil region, they must recognize the importance of pastoral livelihoods and the significance of environmental variability in the context of planned interventions. In addition, livelihood profiles vary across rural Djibouti between those that are totally livestock-less and seek to integrate urban life and those who still have sufficient remaining animals for the practice of incomplete transhumance. Therefore, the suitability of solutions differs depending on the nature of the livelihood relied upon. Overall, there is a need for rural pastoralists to make the most out of both worlds.

Firstly, it is necessary to incorporate pastoral communities' views and understandings of risk as part of disaster risk reduction measures. For these measures to be effective, the indigenous must be involved at all levels of planning and response. Indirectly, since environmental contexts and livelihood profiles may vary between zones within and between regions, there must be effective institutional decentralization of power and responsibility to the lowest level with adequate service provision and accountability. Such an institutional endeavour would diminish the likelihood of implementing 'blanket' solutions and provide the ability of decentralized state officials to implement well-adapted and coherent interventions. These interventions would need to be administered and managed at local level in harmony with traditional customary arrangements. At higher level, since Chapter Four showed that mobile pastoralist systems often crossed international borders, political and diplomatic avenues must be searched in trying to understand and develop the potential of cross-border activities in the context of vulnerability reduction in the face of droughts. This would alleviate pressure on rural Djibouti's grazing lands, increase cross-border exchange, improve local livelihoods, contribute to national economies and, more importantly, lower the risk of famine and/or food insecurity in the Horn of Africa. It is a legal endeavour that

must rely on cooperation rather than competition, bottom-up approach rather than top-down, involving local indigenous leadership in the Issa ecosystem and the Horn of Africa.

Secondly, a multi-level response to the different immediate factors of vulnerability must be implemented. For those households who lost most of their animals and who were relatively dependent on food aid for survival, Chapter Seven showed that these households' vulnerability to drought was a translation of a failed livelihood transition from a deeply rural setting to a setting with mixed rural and urban features. From an urban perspective, government institutions must facilitate the progressive integration of stock-less herders into the urban economy. Policies must be adopted to put in place short training programmes (preferably internally financed) for herders to acquire skills relevant to manual wage labour in an urban setting with the financial and technical assistance of UNICEF, UNDP and the FAO. On the rural side, a common failing of drought vulnerability response and rangeland development projects in Africa is "to focus on single issues and interventions in isolation" (Devereux 2006, p.168) when in fact this research has shown that there is a wide range of social-environmental factors that contributed to vulnerability generation and increase. In turn, the response must also be multi-pronged. Consequently, the Djiboutian State may address rural vulnerability by improving animal health with veterinary services provision, protecting human health with mobile clinics and access to functional health centres, providing alternative rural livelihoods through specific and useful training, safe water access through improved water infrastructure[70] and livestock management through improving the marketing system and communication links *altogether*.

Thirdly, rather than implementing the above procedures in an exogenous manner and solely by the State, rural communities' leadership must also be involved, sensitized and encouraged to foster a culture of environmental protection and preservation in the villages which includes protecting young plants and re-establishing the traditional customary rules of *mise en défens* to allow pasture lands to regrow. As a fascinating proof of success, one example to be cited is the grass-roots association EVA in Tadjoura which, through community mentality change and local implementation of environmental protection measures, managed to allow pasture lands to regrow over a certain period of time. This confirms Ellis and Swift (1988) and Scoones (1995)'s position

[70] There must imperatively be a study looking at the state and recharge rate of underground water resources.

about the reversibility of seemingly degraded lands when the required environmental variables (including rainfall, humidity, temperature, soil content, etc.) are present. Given the intimate connections that exist between vegetation cover and atmospheric processes, reversing environmental degradation in rural areas could improve soil content, lessen topsoil erosion, improve water infiltration to recharge underground aquifers and may therefore increase the availability of both nutritious pasture and water both in quantity and quality.

Further, it is contended that agriculture is not a viable alternative in the arid/semi-arid areas of rural Djibouti for three main reasons. Firstly, plant cultivation requires pumping of great quantities of water from underground aquifers. Given the unknown levels of underground water quantity and yearly recharge rates (except for Djibouti city's aquifer), it would be highly risky and unsustainable in the long-run. Secondly, in light of Dikhil region's climate (and rural Djibouti in general) discussed in Chapter Six, agriculture cannot be rain-fed and requires the implementation of engineering works which are costly (both for their installation and maintenance) and highly technical. Thirdly, given the preferential rates at which Djibouti imports its food products (mainly from Ethiopia), the unequal terms of trade means that pastoralists would not obtain sufficient returns to live from it.

Despite the practical and theoretical findings discussed and the policy implications that could improve rural households' vulnerability to drought, various limitations to this study do exist. The following section presents these limitations and associated opportunities for further research.

## 9.4 Study limitations and directions for future research

This section reviews the theoretical underpinnings of the research and criticizes the practical methods applied to generate relevant data in addressing the research question and sub-questions that guided this reflection on rural vulnerability to drought. Following a brief reminder of the thinking and methods used, some of the limitations and avenues for further research on the problematic of rural food insecurity in Djibouti are explored.

As discussed in Chapter Three, the main thinking that formed the geographical basis of this research was post-structural in nature and therefore questioned the aetiology of social-environmental structures responsible for laying the ground to vulnerability to drought. Consequently, not only were some of the social structures embedded within pastoral identities (Chapter Four) and institutional processes of change in Djibouti city (Chapter Five) with regards to the practice of pastoralism unveiled, but their relationship with environmental processes (Chapter Six and especially Chapter Seven) were also investigated to account for the appearance of unsafe conditions (Chapter Seven). Loyal to this vision, the Pressure and Release (PAR) model was thus elected to uncover the production of vulnerability beyond temporally and spatially assumed scales of influence.

As stated in Chapter Three, considerations of scale are significant in the study of vulnerability. The influential presence of 'a production of vulnerability' process assumes the existence of underlying social-environmental connections between current rural vulnerability to drought and far-flung, contemporary and immediate factors. This premise was integral to the post-structural geographical approach and the study of vulnerability through the PAR model. Further, it was assumed and demonstrated from Chapter Four to Chapter Eight that 'vulnerability' is spatially created but also co-creates itself through various interactions that are borne, terminated and/or redefined with institutional and environmental change. In this respect, the PAR model is a general explanatory model for the production of vulnerability but its proponents did not suggest ways to apply it concretely in the field whether in a research or policy context. Instead, the Access model (Wisner et al. 2004, p.88-97) was proposed to better reify some of the vulnerability concepts of the PAR model at the household level. This possible 'weakness' of the PAR model was exploited as a strengthening element of the model whereby Chapters Four and Five discussed root causes and dynamic pressures from a very remote perspective both in time and space before connecting these underlying elements with the immediate contemporary unsafe conditions of Chapter Seven identified in the five study sites. At the same time, during the research, it was felt that the infinite array of probable thinking routes that could have been followed in investigating vulnerability was also limited by the possible practical methods that could have been employed due to time and logistical constraints. Three main limitations to this research are discussed hereafter with possible opportunities to build on this study's findings.

The first limitation corresponds to the lack of homogeneity in the application of fieldwork methods in all five villages. Over 80 semi-structured interviews were completed in Sankal but not in the other four villages. The questions asked covered historical drought occurrence, human and social capital, formal and informal transfers, current food security and consumption, changes in livestock production and use as well as livelihood change due to constraints and opportunities. In addition, these interviews were directly carried out by myself. In contrast, the interviews used to generate the community coping strategy indexes (CSIs) in Hanlé 2, Koutabouya, Dadahalou and Bondora were structured and carried out by an investigative team. Conversely, the focus-groups and structured interviews used for the CSIs and the participatory vulnerability and capacity assessments (PVCAs) were not applied in Sankal. As described in Chapter Three, the main reason behind differences in data gathering methods between Sankal on one hand and Hanlé 2, Koutabouya, Dadahalou and Bondora on the other is linked to the unforeseen sequence of events which forced me to divide my fieldwork in two parts. For better triangulation of the data and generation of more accurate ethnographic and participatory information, it would have been more informative to apply the same series of qualitative methods in all villages. Moreover, although usage of the PVCAs and the CSIs were helpful in uncovering the unsafe conditions in Chapter Seven and both the vulnerability profile and coping capacities of households in Chapter Eight, the data could be complemented with quantification methods based on participatory information collection. One technique borrowed from the engineering discipline and already successfully applied in India (Andhra Pradesh), Portugal (Algarve and Alentejo) and Russia (Volgograd and Saratov) in 2001 is the application of fuzzy-logic quantification (Ragin 2000, Alcamo et al. 2008, Krömker et al. 2008, Taenzler et al. 2008). To evaluate the exposure and susceptibility of households to the uncertainty of drought occurrence while including the experts' external opinion about their vulnerability to the hazard, the quantification method relies on strictly structured questionnaires whereby the responses could then be converted into meaningful numbers that measure vulnerability to drought.

The second main limitation to this study has to do with the target individuals interviewed and their livelihoods. As stated in Chapter One, the research question addressed by the thesis specifically concerns rural vulnerability to drought in Djibouti with sub-questions meant to investigate the drivers of livelihood change concomitant with both environmental and institutional change. In

addition, as exemplified in Chapter Eight, the study of vulnerability creation showed that the sedentarization process is a reflection of the nomadic households' pauperization process with higher malnutrition and morbidity rates compared to when they were nomads. As shown in Chapter Three, the target groups, although pastoral and/or agro-pastoral, were already settled even though in certain households, men sometimes left for extensive transhumance herding, especially in Koutabouya and Hanlé 2. As a suggestion for further research, it would be interesting to incorporate qualitative information from remaining nomadic households not only for comparing drought and vulnerability perceptions with settled groups, but also for objective livelihood, nutritional and morbidity comparisons. Firstly, such a study would feed the debate discussed in Chapter Eight on the purported increased malnutrition and morbidity rates as a result of the sedentarization process. Secondly, movement with remaining transhumant/nomadic herders would give the research the opportunity to assess the actual state of both summer and refuge pasture lands in Dikhil region (Figure 4.6 in Chapter Four) that were degraded and those still seasonally sought for livestock grazing and water access. Such information would greatly enrich research on the state of pasture lands and more generally transhumance routes both traditionally used in the past and those followed in more recent times.

The third main limitation identified in this research is linked to the evidence used for effective conceptualization and understanding of drought and climate dynamics in Dikhil region and rural Djibouti in general. As enunciated in Chapter Six, the data obtained from the GIEWS database of the FAO emanated from near-real-time satellite images produced by METEOSAT. The implication is that decadal and monthly rainfall data extracted for the 2007-2013 period are proxies for rainfall and therefore do not measure actual precipitation amounts *per se*. The pre-defined algorithms expressing rainfall rate as a function of observed quantities were hardly calibrated to real fluctuations in certain environmental variables behind the parameters. As mentioned in Chapter Four, there is only one meteorological station based in Djibouti city which measured real precipitation amounts. However, since there are plans to establish additional meteorological stations inland (including Dikhil region), it would be useful to collect rain gauge measurements over one or more rainfall seasonal cycles and compare it with both nomadic and settled pastoralists' perception of rainfall fluctuations. In addition, as also discussed in Chapter Six, there are several ecosystem feedback loops feeding into both vegetative cover and atmospheric

processes in influencing climate. Further research is needed in obtaining and analyzing a wider array of data on various abiotic variables including humidity, temperature, evaporation and wind currents. Such research in parallel to enhanced qualitative research about drought vulnerability would add useful insights into the social-environmental understanding of vulnerability to drought in Dikhil region and rural Djibouti in general.

## 9.5 Conclusion

This chapter uncovered emerging linkages, connections and conclusions in response to the research question and its sub-questions. The first part of the chapter reviewed the main empirical findings which debunked three rural food insecurity myths.

Firstly, rural pastoralists and the practice the extensive pastoralism as it is currently effectuated is not the main driver of land degradation in rural areas. Rather, the underlying reasons lie in several temporally remote mechanisms of institutional and environmental change which gradually undermined the sustainable practice of pastoralism in rural Djibouti. Therefore, rather than extensive pastoralism, root causes of space reduction for its practice are to blame for land degradation and ensuing desertification processes reinforced by ecosystem feedback loops.

Secondly, Djibouti's independence and formal economic integration into the world economy did not have beneficial effects on pastoral livelihoods. On the contrary, pastoralists' marginalization and side-effects linked to lack of resource distribution and investments in the rehabilitation of pastoral livelihoods and environmental protection were dynamic pressures that reinforced the root causes of vulnerability.

Thirdly, drought was not responsible for pastoralists' chronic food insecurity. Following the structural processes described above, the gradual erosion of nomadic pastoral livelihoods in the face of 'normal' droughts and dry periods forced and encouraged many households to settle in villages. As exemplified in the Hanlé 2, Koutabouya, Dadahalou and Bondora, sedentarization

rhymed with impoverishment in unsafe conditions. These unsafe conditions of living then impacted human vulnerability to drought at various levels.

The second part of the chapter reviewed theoretical findings which emerged from fieldwork and their policy implication for intervention. The main message conveyed is that since vulnerability to 'normal' episodes of drought is the main issue faced by pastoralists, the conceptual perception which much drive policy making and interventions to address rural food insecurity must target the rehabilitation and/or creation of sustainable livelihood alternatives to allow pastoral households to emerge from chronic food insecurity.

Although the post-structural outlook adopted by the study and the conclusions reached inform the present debate over the main causes of rural food insecurity in Djibouti, several limitations to the study were nevertheless identified. The third part of the chapter unveiled concerns over the homogeneity of fieldwork methods, the nature of the study subjects targeted by the research and the lack of actual rain gauge data as challenges in developing a comprehensive understanding of the dynamics between vulnerability production and hazard occurrence. However these limitations are also research opportunities in furthering understanding. Several avenues for further research were therefore proposed to build on this research's results.

Given this body of work, its limitations, its hypotheses and research questions, this study formally concludes that rural chronic food insecurity in the study sites, Dikhil region and the Issa ecosystem is not due to decreasing rainfall patterns. Rather, the underlying main reason is that rural households' vulnerability increased to a point where they are experiencing great difficulty in resisting, absorbing and recovering from 'normal' droughts' and dry seasons' impacts.

# References


Abdi, K. (2003). "The early development of pastoralism in the Central Zagros Mountains." Journal of World Prehistory **17**(4): 395-448.

Abule, E., H. A. Snyman and G. N. Smit (2005). "Comparisons of pastoralists perceptions about rangeland resource utilisation in the Middle Awash Valley of Ethiopia." Journal of Environmental Management **75**(1): 21-35.

Adger, W. N. (2006). "Vulnerability." Global Environmental Change **16**(3): 268-281.

Adongo, A. O., B. Shell-Duncan and J. Prisca Tuitoek (2013). "Effect of settlement on nutrition and health status of pastoral Gabra women of reproductive age in Kalacha Location, Marsabit County, Kenya." Public health nutrition **16**(09): 1622-1630.

Agnew, C. and A. Warren (1996). "A framework for tackling drought and land degradation." Journal of Arid Environments **33**(3): 309-320.

Agnew, C. T. and A. Chappell (1999). "Drought in the Sahel." GeoJournal **48**(4): 299-311.

Aitken, S. and G. Valentine (2006). Ways of Knowing and Ways of Doing Geographic Research Approaches to Human Geography. S. Aitken and G. Valentine. London, SAGE Publications**:** pp. 1-12.

Alcamo, J., L. Acosta-Michlik, A. Carius, F. Eierdanz, R. Klein, D. Krömker and D. Tänzler (2008). "A new approach to quantifying and comparing vulnerability to drought." Regional Environmental Change **8**(4): 137-149.

Allington, G. R. H. and T. J. Valone (2010). "Reversal of desertification: the role of physical and chemical soil properties." Journal of Arid Environments **74**(8): 973-977.

Almazroui, M., M. Nazrul Islam, H. Athar, P. Jones and M. A. Rahman (2012). "Recent climate change in the Arabian Peninsula: Annual rainfall and temperature analysis of Saudi Arabia for 1978–2009." International Journal of Climatology **32**(6): 953-966.

Alwang, J., P. B. Siegel and S. L. Jorgensen (2001). "Vulnerability: A View From Different Disciplines." Social Protection Discussion Paper Series(No. 00115): 42.

Aregu, L. and Y. Belete (2007). Coping with drought in the Borana rangelands. Gender & Pastoralism: Rangeland & Resource Management in Ethiopia. A. Ridgewell, G. Mamo and F. Flintan. Addis Ababa, Ethiopia, SOS Sahel Ethiopia. **1:** 59-70.

Asfaw, S., M. Amare and G. Calfat (2011). Food Aid and Rural Poverty in Ethiopia**:** 1-24.

Audru, J., J. Cesar, G. Forgiarini and J. P. Lebrun (1987). La végétation et les potentialités pastorales de la République de Djibouti. Djibouti, Institut d'Elevage et de Médecine Véterinaire des Pays Tropicaux.

Aven, T. (2011). "On some recent definitions and analysis frameworks for risk, vulnerability, and resilience." Risk Analysis **31**(4): 515-522.

Ayantunde, A. A., J. De Leeuw, M. D. Turner and M. Said (2011). "Challenges of assessing the sustainability of (agro)-pastoral systems." Livestock Science **139**(1): 30-43.

Bailey, J. (2012). "Gender dimensions of drought and pastoral mobility among the Maasai." The Africa Portal(22): 1-7.

Barkey, N. L., B. C. Campbell and P. W. Leslie (2001). "A comparison of health complaints of settled and nomadic Turkana men." Medical Anthropology Quarterly **15**(3): 391-408.

Barrett, C., K. Smith and P. Box (2001). "Not necessarily in the same boat: Heterogeneous risk assessment among East African pastoralists." Journal of Development Studies **37**(5): 1-30.

Barrow, C. (1987). Water Resources and Agricultural Development in the Tropics. Essex, Longman Scientific and Technical.

Behnke, R. H. (2000). "Equilibrium and non-equilibrium models of livestock population dynamics in pastoral Africa: Their relevance to Arctic grazing systems." Rangifer **20**(2-3): 141-152.

Behnke, R. H. and I. Scoones (1992). "Rethinking range ecology: Implications for rangeland management in Africa." Issues Paper-Drylands Programme: 1-43.

Bewket, W. and D. Conway (2007). "A note on the temporal and spatial variability of rainfall in the drought-prone Amhara region of Ethiopia." International Journal of Climatology **27**(11): 1467-1477.

Biersteker, T. J. (1990). "Reducing the role of the state in the economy: a conceptual exploration of IMF and World Bank prescriptions." International Studies Quarterly: 477-492.

Birkmann, J. (2006). Measuring vulnerability to promote disaster-resilient societies: Conceptual frameworks and definitions. Measuring Vulnerability to Natural Hazards: Towards Disaster Resilient Societies. J. Birkmann. Tokyo, United Nations University Press**:** pp.9-54.

Birkmann, J., O. D. Cardona, M. L. Carreno, A. H. Barbat, M. Pelling, S. Schneiderbauer, S. Kienberger, M. Keiler, D. Alexander and P. Zeil (2013a). "Framing vulnerability, risk and societal responses: the MOVE framework." Natural Hazards **67**(2): 193-211.

Birkmann, J., S. L. Cutter, D. S. Rothman, T. Welle, M. Garschagen, B. van Ruijven, B. O'Neill, B. L. Preston, S. Kienberger and O. D. Cardona (2013b). "Scenarios for vulnerability: opportunities and constraints in the context of climate change and disaster risk." Climatic Change: 1-16.

Blaikie, P. (2008). "Epilogue: Towards a future for political ecology that works." Geoforum **39**(2): 765-772.

Blaikie, P., T. Cannon, I. Davis and B. Wisner (1994). At risk: natural hazards, people's vulnerability, and disasters. London and New York, Routledge.

Bohle, H. G. (2001). "Vulnerability and Criticality: Perspectives from social geography." Newsletter of the International Human Dimensions Programme on Global Environmental Change(Nr.2/2001): 1-7.

Bohle, H. G., T. E. Downing and M. J. Watts (1994). "Climate change and social vulnerability: Toward a sociology and geography of food insecurity." Global Environmental Change **4**(1): 37-48.

Bollig, M. (2000). "Turkana Herders of the Dry Savanna. Ecology and Biobehavioral Response of Nomads to an Uncertain Enviroment by Michael A. Little; Paul W. Leslie (Book Review)." Anthropos **95**(2): 616-618.

Bosco, F. J. (2006). Actor-Network Theory, Networks, and Relational Approaches in Human Geography. Approaches to Human Geography. S. Aitken and G. Valentine. London, SAGE Publications**:** pp. 136-146.

Brass, J. N. and D. K. Leonard (2008). The political economy of livestock policy: The case of Djibouti, Inter-Governmental Authority on Development**:** 1-44.

Braun, B. and J. Wainwright (2001). Nature, Poststructuralism, and Politics. Social Nature: Theory, Practice, and Politics. N. Castree and B. Braun. Malden and Oxford, Blackwell Publishers**:** pp. 41-63.

Brown, B. (2011). Horn of Africa tested by severe drought. United Kingdom (UK), BBC**:** 1.

Buira, A. (2009). An analysis of IMF conditionality. G-24 Discussion Paper Series. New York and Geneva, United Nations. **22:** 30.

Busch, L. and A. Juska (1997). "Beyond political economy: actor networks and the globalization of agriculture." Review of International Political Economy **4**(4): 688 - 708.

Caesar, J., L. V. Alexander, B. Trewin, K. Tse-ring, L. Sorany, V. Vuniyayawa, N. Keosavang, A. Shimana, M. M. Htay and J. Karmacharya (2011). "Changes in temperature and precipitation extremes over the Indo-Pacific region from 1971 to 2005." International Journal of Climatology **31**(6): 791-801.

Cairncross, S., C. Hunt, S. Boisson, K. Bostoen, V. Curtis, I. C. H. Fung and W.-P. Schmidt (2010). "Water, sanitation and hygiene for the prevention of diarrhoea." International journal of Epidemiology **39**(suppl 1): i193-i205.

Camberlin, P. and N. Philippon (2002). "The East African March–May Rainy Season: Associated Atmospheric Dynamics and Predictability over the 1968–97 Period." Journal of Climate **15**(9): 1002-1019.

Cannon, T., J. Twigg and J. Rowell (2003). Social Vulnerability, Sustainable Livelihoods and Disasters. London, Department for International Development (DFID)**:** pp.1-63.

Carcillo, J. A., J. M. Dean, R. Holubkov, J. Berger, K. L. Meert, K. Anand, J. Zimmerman, C. J. Newth, R. Harrison and M. J. Burr (2012). "The randomized comparative pediatric critical illness

stress-induced immune suppression (CRISIS) prevention trial." Pediatric Critical Care Medicine **13**(2): 165.

Cardona, O. D. (2004). The Need for Rethinking the Concepts of Vulnerability and Risk from a Holistic Perspective: A Necessary Review and Criticism for Effective Risk Management. Mapping Vulnerability: Disasters, Development and People. G. Bankoff, G. Frerks and D. Hilhorst. London, Earthscan**:** 37-51.

Catley, A. and A. Iyasu (2010). Moving Up or Moving Out? A Rapid Livelihoods and Conflict Analysis in Mieso-Mulu Woreda, Shinile Zone, Somali Region, Ethiopia, Mercy Corps and Feinstein International Center, Tufts University 1-100.

CEWARN (2007). CEWARN Baseline Report in Dikhil region, Republic of Djibouti, The Conflict Early Warning and Response mechanism, Inter-Governmental Authority on Development**:** 27.

Chabasse, D., C. Roure, A. Rhaly, D. Maiga, M. Traore, A. Tounkara, H. Dumon and P. Ranque (1982). "Evaluation of the health status of nomadic and semi-nomadic populations of the Gourma-Mali: Epidemiologic approach. II. Overall results and conclusions." Medecine tropicale: revue du Corps de sante colonial **43**(2): 127-135.

Chapin III, F. S., J. T. Randerson, A. D. McGuire, J. A. Foley and C. B. Field (2008). "Changing feedbacks in the climate-biosphere system." Frontiers in Ecology and the Environment **6**(6): 313-320.

Charpin, M. and J.-P. Georget (1977). "Comparaison anthropologique entre les Afars et les Issas de Djibouti." Bulletins et Mémoires de la Société d'anthropologie de Paris **4**(2): 113-119.

Cheung, W. H., G. B. Senay and A. Singh (2008). "Trends and spatial distribution of annual and seasonal rainfall in Ethiopia." International Journal of Climatology **28**(13): 1723-1734.

Chevallier, M. (2011). "Pourquoi la famine revient-elle?" Alternatives économiques(9): 32-33.

Chiré, A. S. (2012). Le nomade et la ville à Djibouti: stratégies d'insertion urbaine et production de territoire, KARTHALA Editions.

Choi, T., J. J. Qu and X. Xiong (2013). A thirteen-year analysis of drought in the horn of Africa with MODIS NDVI and NWDI measurements. Second International Conference on Agro-Geoinformatics, Fairfax, VA, IEEE.

Clarke, D. B. (2006). Postmodern Geographies and the Ruins of Modernity. Approaches to Human Geography. S. Aitken and G. Valentine. London, SAGE Publications**:** pp. 107-121.

Cohen, S., D. Janicki-Deverts and G. E. Miller (2007). "Psychological stress and disease." Jama **298**(14): 1685-1687.

Collinge, C. (2006). "Flat ontology and the deconstruction of scale: a response to Marston, Jones and Woodward." Transactions of the Institute of British Geographers **31**(2): 244-251.

Combes, J.-L., C. H. Ebeke, S. M. N. Etoundi and T. U. Yogo (2014). "Are Remittances and Foreign Aid a Hedge Against Food Price Shocks in Developing Countries?" World Development **54**: 81-98.

Coppock, D. L. and S. Desta (2013). "Collective action, innovation, and wealth generation among settled pastoral women in northern Kenya." Rangeland Ecology & Management **66**(1): 95-105.

Costa, L. and J. P. Kropp (2013). "Linking components of vulnerability in theoretic frameworks and case studies." Sustainability science **8**(1): 1-9.

Coubba, A. (1993). Djibouti: une nation en otage, l'Harmattan.

Coubba, A. (1995). Le mal djiboutien: Rivalités ethniques et enjeux politiques, l'Harmattan.

CRD and CRB (2011). Perspectives au-delà de la sécheresse à Djibouti: Opportunités pour réduire la vulnérabilité des communautés pastorales. Djibouti, Croissant Rouge de Djibouti et Croix-Rouge Britannique**:** 37.

Cutter, S. L. (1996). "Vulnerability to environmental hazards." Progress in Human Geography **20**(4): 529-539.

Cutter, S. L., L. Barnes, M. Berry, C. Burton, E. Evans, E. Tate and J. Webb (2008a). "A place-based model for understanding community resilience to natural disasters." Global Environmental Change **18**(4): 598-606.

Cutter, S. L., C. T. Emrich, J. J. Webb and D. Morath (2009). Social vulnerability to climate variability hazards: A review of the literature, Oxfam America**:** 44.

Cutter, S. L. and C. Finch (2008b). "Temporal and spatial changes in social vulnerability to natural hazards." Proceedings of the National Academy of Sciences **105**(7): 2301-2306.

Dai, A. (2011). "Drought under global warming: a review." Wiley Interdisciplinary Reviews: Climate Change **2**(1): 45-65.

DATE (2000a). Plan d'Action National pour l'Environnement 2001-2010. Djibouti, Direction de l'Aménagement du Territoire et de l'Environnement, Ministère de l'Habitat, de l'Urbanisme, de l' Environnement et de l'Aménagement du Territoire, Gouvernement de Djibouti**:** 1-128.

DATE (2000b). Stratégie et Programme d'Action National pour la Diversité Biologique. Djibouti, Direction de l'Aménagement du Territoire et de l'Environnement, Ministère de l'Habitat, de l'Urbanisme, de l'Environnement et de l'Aménagement du Territoire, Gouvernement de Djibouti**:** 161.

DATE (2006). Programme d'Action National d'Adaptation aux Changements Climatiques. Djibouti, Direction de l'Aménagement du Territoire et de l'Environnement, Ministère de l'Habitat, de l'Urbanisme, de l'Environnement et de l'Aménagement du Territoire, Gouvernement de Djibouti et Partenaires**:** 83.

Datta, A. and A. De (2008). "Reimagining impossible worlds: beyond circumcized geographical imaginations." Progress in Human Geography **32**(5): 603-612.

Davis, R. (2003). "Development in Eco-logics: Power and Change in Arturo Escobar's Political Ecology." Studies in Political Economy **70**: 153-172.

De Leeuw, P. and J. Tothill (1990). "The concept of rangeland carrying capacity in sub-saharan Africa: Myth or reality?" Land degradation and rehabilitation, Pastoral Development Network: 1-19.

Dejene, A. (1990). Environment, famine, and politics in Ethiopia : A view from the village. Boulder, L. Rienner Publishers.

Desta, S. and D. L. Coppock (2004). "Pastoralism under pressure: Tracking system change in southern Ethiopia." Human Ecology **32**(4): 465-486.

Devereux, S. (2006). Vulnerable livelihoods in Somali Region, Ethiopia. IDS Research Report 57. Brighton, Institute of Development Studies (IDS)**:** 196.

Dibben, C. and D. K. Chester (1999). "Human vulnerability in volcanic environments: the case of Furnas, Sao Miguel, Azores." Journal of Volcanology and Geothermal Research **92**(1): 133-150.

Dikman, J. (1998). "Carrying capacity: outdated concept or useful livestock management tool." Overseas Development Institute, Pastoral Development Network: 1-8.

Dilley, M. and T. E. Boudreau (2001). "Coming to terms with vulnerability: a critique of the food security definition." Food Policy **26**(3): 229-247.

Diriba, G. (1995). Economy at the crossroads: Famine and food security in rural Ethiopia. Addis Ababa, Care International in Ethiopia.

DISED (2003). Annuaire Statistique de Djibouti. Djibouti, Direction de la Statistique et des Etudes Démographiques, Ministère de l'Economie et des Finances chargé de l'Industrie et de la Plannification, Gouvernement de Djibouti**:** 165.

DISED (2007). Annuaire Statistique de Djibouti. Djibouti, Direction de la Statistique et des Etudes Démographiques, Ministère de l'Economie et des Finances chargé de l'Industrie et de la Plannification, Gouvernement de Djibouti**:** 165.

DISED (2012). Annuaire Statistique de Djibouti. Djibouti, Direction de la Statistique et des Etudes Démographiques, Ministère de l'Economie et des Finances chargé de l'Industrie et de la Plannification, Gouvernement de Djibouti**:** 125.

Djama, M. (1997). "Trajectoire du pouvoir en pays somali (The Trajectory of Power among the Somali)." Cahiers d'Etudes africaines: 403-428.

Donat, M. G., T. C. Peterson, M. Brunet, A. D. King, M. Almazroui, R. K. Kolli, D. Boucherf, A. Y. Al-Mulla, A. Y. Nour, A. A. Aly, T. A. A. Nada, M. M. Semawi, H. A. Al Dashti, T. G. Salhab, K. I. El Fadli, M. K. Muftah, S. Dah Eida, W. Badi, F. Driouech, K. El Rhaz, M. J. Y. Abubaker, A. S. Ghulam, A. S. Erayah, M. B. Mansour, W. O. Alabdouli, J. S. Al Dhanhani and M. N. Al Shekaili (2014). "Changes in extreme temperature and precipitation in the Arab region: long-term trends and variability related to ENSO and NAO." International Journal of Climatology **34**(3): 581-592.

Downing, T. E. (1991). "Vulnerability to hunger in Africa: A climate change perspective." Global Environmental Change **1**(5): 365-380.

Downing, T. E. and J. Ingram (2003). Integrating Social Vulnerability into Research on Food systems and Global Change, NERC-SEI**:** 7.

Downing, T. E. and L. Nygatan (2005). Integrating Social Vulnerability into Water Management. NeWater, Stockholm Environment Institute (SEI)**:** 32.

Dubois, C. (2007). Atlas de Djibouti: Histoire. Atlas de l'Afrique. Djibouti, Editions J.A.**:** 20-21.

Dyck, I. and R. A. Kearns (2006). Structuration Theory: Agency, Structure and Everyday Life. Approaches to Human Geography. S. Aitken and G. Valentine. London, SAGE Publications**:** pp. 86-97.

Dyson-Hudson, R. and N. Dyson-Hudson (1980). "Nomadic pastoralism." Annual Review of Anthropology: 15-61.

Eakin, H. and A. L. Luers (2006). "Assessing the Vulnerability of Social-Environmental Systems." Annual Review of Environment and Resources **31**(1): 365-394.

East, R. (1984). "Rainfall, soil nutrient status and biomass of large African savanna mammals." African journal of Ecology **22**(4): 245-270.

Ekpo, U. F., A. M. Omotayo and M. A. Dipeolu (2008). "Prevalence of malnutrition among settled pastoral Fulani children in Southwest Nigeria." BMC Research Notes **1**(1): 1-7.

Ellis, F. (2003). Human Vulnerability and Food Insecurity: Policy Implications. London, Forum for Food Security in Southern Africa**:** 40.

Ellis, J. E. and D. M. Swift (1988). "Stability of African pastoral ecosystems: Alternate paradigms and implications for development." Journal of range management **41**(6): 450-459.

Eneyew, A. (2012). "Is settling pastoralists a viable livelihood strategy? Implication for policy dialogue." Scholarly Journal of Agricultural Science **2**(5): 94-102.

Ensminger, J. and A. Rutten (1991). "The political economy of changing property rights: Dismantling a pastoral commons." American Ethnologist **18**(4): 683-699.

Entrikin, J. N. and J. H. Tepple (2006). Humanism and Democratic Place-Making. Approaches to Human Geography. S. Aitken and G. Valentine. London, SAGE Publications**:** pp. 30-41.

Escobar, A. (1996). "Construction nature : Elements for a post-structuralist political ecology." Futures **28**(4): 325-343.

Escobar, A. (2007). "The 'ontological turn' in social theory. A Commentary on 'Human geography without scale', by Sallie Marston, John Paul Jones II and Keith Woodward." Transactions of the Institute of British Geographers **32**(1): 106-111.

Exner, M., G. Klein, A. Rechkemmer and F. Schmidt, Eds. (2008). Towards Sustainable Global Health. Publication Series of UNU-EHS. Bonn, UNU-EHS.

FAD (2004a). Djibouti: Document de Strategie par Pays. Djibouti, Fonds Africain de Développement (FAD), Banque Africaine de Développement (BAD)**:** 45.

FAD (2004b). Djibouti: Document de Strategie par Pays (Executive Summary). Djibouti, African Development Fund, African Development Bank (AfDB)**:** 8.

Fara, K. (2001). "How natural are'natural disasters'? Vulnerability to drought of communal farmers in Southern Namibia." Risk Management **3**(3): 47-63.

Fekete, A., M. Damm and J. Birkmann (2010). "Scales as a challenge for vulnerability assessment." Natural Hazards **55**(3): 729-747.

Fekete, A., G. Hufschmidt and S. Kruse (2014). "Benefits and challenges of resilience and vulnerability for disaster risk management." International Journal of Disaster Risk Science **5**(1): 3-20.

FEWS-Net (2007). Review of Trade and Markets Relevant to Food Security in the Greater Horn of Africa. Nairobi, Famine Early Warning System Network and the United States Agency for International Development**:** 53.

FEWS-Net (2010). Cross-border Livestock Trade Assessment Report: Impacts on lifting the livestock import ban on food security in Somalia, Ethiopia, and the Djibouti Borderland. Nairobi,

Famine Early Warning System Network and United States Agency for International Development**:** 8.

FEWS-Net (2012). Djibouti Food Security Outlook: October 2012 to March 2013. Djibouti, Famine Early Warning System Network and United States Agency for International Development**:** 5.

FEWS-Net (2013a). Djibouti: Mises à jour de la sécurité Alimentaire (Février-Mars 2013). Djibouti, Famine Early Warning System Network and United States Agency for International Development**:** 2.

FEWS-Net (2013b). Djibouti: Mises à jour de la sécurité Alimentaire (Mars 2013). Djibouti, Famine Early Warning System Network and United States Agency for International Development**:** 2.

Fraser, E. D. G., A. J. Dougill, K. Hubacek, C. H. Quinn, J. Sendzimir and M. Termansen (2011). "Assessing vulnerability to climate change in dryland livelihood systems: Conceptual challenges and interdisciplinary solutions." Ecology & society **16**(3).

Fraser, E. D. G., W. Mabee and O. Slaymaker (2003). "Mutual vulnerability, mutual dependence: The reflexive relation between human society and the environment." Global Environmental Change **13**(2): 137-144.

Fratkin, E. (2001a). "East African pastoralism in transition: Maasai, Boran, and Rendille cases." African Studies Review **44**(3): 1-25.

Fratkin, E. (2001b). "East African pastoralism in transition: Maasai, Boran, and Rendille cases." African Studies Review: 1-25.

Fratkin, E., M. A. Nathan and E. A. Roth (2006). Is settling good for pastoralists? The effects of pastoral sedentarization on children's nutrition, growth and health among Rendille and Ariaal of Marsabit, Northern Kenya. Pastoralism and Poverty Reduction in East Africa: A Policy Research Conference. Nairobi, Kenya**:** 1-33.

Fratkin, E., M. A. Nathan and E. A. Roth (2011). Seeking Alternative Livelihoods in Northern Kenya: Costs and Benefits in Health and Nutrition. International Conference on the Future of Pastoralism, Feinstein International Center, Tufts University**:** 1-21.

Fratkin, E., E. A. Roth and M. A. Nathan (2004). "Pastoral sedentarization and its effects on children's diet, health, and growth among Rendille of northern Kenya." Human Ecology **32**(5): 531-559.

Fratkin, E. and K. Smith (1995). "Women's changing economic roles with pastoral sedentarization: varying strategies in alternate Rendille communities." Human Ecology **23**(4): 433-454.

Fratkin, E. M., E. A. Roth and M. A. Nathan (1999). "When Nomads Settle: The Effects of Commoditization, Nutritional Change, and Formal Education on Ariaal and Rendille Pastoralists." Current Anthropology **40**(5): 729-735.

Frenken, K. (2005). L'irrigation en Afrique en chiffres. Enquête AQUASTAT, Food and Agriculture Organisation**:** 1-652.

Fritz, H. and P. Duncan (1994). "On the carrying capacity for large ungulates of African savanna ecosystems." Proceedings of the Royal Society of London. Series B: Biological Sciences **256**(1345): 77-82.

Füssel, H.-M. (2007a). "Vulnerability: A generally applicable conceptual framework for climate change research." Global Environmental Change **17**(2): 155-167.

Füssel, H.-M. and R. Klein (2006). "Climate Change Vulnerability Assessments: An Evolution of Conceptual Thinking." Climatic Change **75**(3): 301-329.

Füssel, H. M. (2007b). "Adaptation planning for climate change: Concepts, assessment approaches, and key lessons." Sustainability science **2**(2): 265-275.

Gaillard, J.-C. (2010). "Vulnerability, capacity and resilience: perspectives for climate and development policy." Journal of International Development **22**(2): 218-232.

Galaty, J. G. (1989). "Pastoralisme, sédentarisation et État en Afrique de l'Est." Politique Africaine(34): 39-59.

Gall, M. (2013). From Social Vulnerability to Resilience: Measuring Progress toward Disaster Risk Reduction. Interdisciplinary Security Connections. Bonn, Germany, United Nations University Institute for Environment and Human Security (UNU-EHS)**:** 1-32.

Gallopín, G. C. (2006). "Linkages between vulnerability, resilience, and adaptive capacity." Global Environmental Change **16**(3): 293-303.

Galvin, K. A. (2009). "Transitions: pastoralists living with change." Annual Review of Anthropology **38**: 185-198.

Galvin, K. A., R. B. Boone, N. M. Smith and S. J. Lynn (2001). "Impacts of climate variability on East African pastoralists: Linking social science and remote sensing." Climate Research **19**(2): 161-172.

Galvin, K. A., P. K. Thornton, R. B. Boone and J. Sunderland (2004). "Climate Variability and impacts on East African livestock herders: The Maasai of Ngorongoro Conservation Area, Tanzania." African Journal of Range & Forage Science **21**(3): 183-189.

Garrett, H. (1968). "The tragedy of the commons." Science **162**(3859): 1243-1248.

Glaser, R., D. Pearl, J. Kiecolt-Glaser and W. B. Malarkey (1994). "Plasma cortisol levels and reactivation of latent Epstein-Barr virus in response to examination stress." Psychoneuroendocrinology **19**(8): 765-772.

Glaser, R., G. R. Pearson, J. F. Jones, J. Hillhouse, S. Kennedy, H. Mao and J. K. Kiecolt-Glaser (1991). "Stress-related activation of Epstein-Barr virus." Brain, Behavior, and Immunity **5**(2): 219-232.

Glaser, R., J. Rice, J. Sheridan, R. Fertel, J. Stout, C. Speicher, D. Pinsky, M. Kotur, A. Post and M. Beck (1987). "Stress-related immune suppression: Health implications." Brain, Behavior, and Immunity **1**(1): 7-20.

Glew, R., R. Bhanji and D. VanderJagt (2003). "Effects of displacement resulting from ethnic/religious conflict on the growth and body composition of Fulani children in northern Nigeria." Journal of tropical pediatrics **49**(5): 279-285.

Glew, R. H., C. A. Conn, T. A. VanderJagt, C. D. Calvin, M. O. Obadofin, M. Crossey and D. J. VanderJagt (2004). "Risk factors for cardiovascular disease and diet of urban and rural dwellers in northern Nigeria." Journal of Health, Population, and Nutrition **22**(4): 357-369.

Glew, R. H., M. Williams, C. A. Conn, S. M. Cadena, M. Crossey, S. N. Okolo and D. J. VanderJagt (2001). "Cardiovascular disease risk factors and diet of Fulani pastoralists of northern Nigeria." The American journal of clinical nutrition **74**(6): 730-736.

GoD (1999a). Djibouti Letter of Intent and Memorandum on Economic and Financial Policies. Djibouti, Government of Djibouti and the International Monetary Fund**:** 16.

GoD (1999b). Enhanced Structural Adjustment Facility Medium-Term Economic and Financial Policy Framework 1999-2002. Djibouti, Government of Djibouti and the International Monetary Fund**:** 20.

GoD (2000). Djibouti Letter of Intent and Memorandum on Economic and Financial Policies. Djibouti, Government of Djibouti and International Monetary Fund**:** 17.

GoD (2001a). Djibouti Letter of Intent and Memorandum of Economic and Financial Policies. Djibouti, Government of Djibouti and International Monetary Fund**:** 21.

GoD (2001b). Poverty Reduction Strategy Paper (Interim Report). Djibouti City, Government of Djibouti**:** 38.

GoD (2001c). Programme d'Action National pour le Développement. Troisième Conférence des Nations Unies sur les Pays les Moins Avancés. Bruxelles, Gouvernement de Djibouti**:** 1-65.

GoD (2002). Poverty Reduction Strategy Paper: Preparation Status Report. Djibouti, Government of Djibouti**:** 9.

GoD (2004a). Cadre Intégré: Etude Diagnostique de l'Intégration Commerciale. Djibouti, Gouvernement de Djibouti**:** 132.

GoD (2004b). Djibouti Letter of Intent and Memorandum of Economic and Financial Policies. Djibouti, Government of Djibouti and International Monetary Fund**:** 19.

GoD (2004c). Djibouti Letter of Intent and Supplementary Memorandum on Economic and Financial Policies. Djibouti, Government of Djibouti**:** 10.

GoD (2005). Djibouti: Staff-Monitored Letter of Intent, Memorandum of Economic and Financial Policies, and Technical Memorandum of Understanding. Djibouti, Government of Djibouti and International Monetary Fund**:** 22.

GoD (2007). Initiative Nationale pour le Développement Social 2008-2012. Djibouti, Gouvernement de Djibouti**:** 135.

GoD (2009). Djibouti Poverty Reduction Strategy Paper. Djibouti, Government of Djibouti and International Monetary Fund**:** 117.

GoD (2012). Djibouti Poverty Reduction Strategy Paper - Annual Progress Report. Djibouti, Government of Djibouti and International Monetary Fund**:** 143.

GoD, IMF and WB (2004). Djibouti Poverty Reduction Strategy Paper. Djibouti, Washington, Government of Djibouti and International Monetary Fund**:** 191.

GoD and UN (2002). Bilan Commun de Pays (CCA). Djibouti, Gouvernement de Djibouti et Système des Nations Unies**:** 116.

GoD and UN (2003). Rapport sur les Objectifs de Développement pour le Millénaire à Djibouti. Djibouti, Gouvernement de Djibouti et Système des Nations Unies**:** 37.

Golledge, R. G. (2006). Philosophical Bases of Behavioral Research in Geography. Approaches to Human Geography. S. Aitken and G. Valentine. London, SAGE Publications**:** pp. 75-85.

Gomes, N. (2006). "Access to water, pastoral resource management and pastoralists' livelihoods: Lessons learned from water development in selected areas of Eastern Africa (Kenya, Ethiopia, Somalia)." FAO LSP WP **26**.

GoS (1974). La Partie du Territoire Somalien sous colonisation Ethiopienne. Somalie, République Démocratique de Somalie.

Greene, M. H. (1974). "Impact of the Sahelian drought in Mauritania, West Africa." The Lancet **303**(7866): 1093-1097.

Gregory, D., R. Johnston, G. Pratt, M. J. Watts and S. Whatmore (2000). The Dictionary of human geography R. J. Johnston. Oxford Wiley-Blackwell.

Grimes, D., E. Pardo-Iguzquiza and R. Bonifacio (1999). "Optimal areal rainfall estimation using raingauges and satellite data." Journal of Hydrology **222**(1): 93-108.

Gu, H.-f., C.-k. Tang and Y.-z. Yang (2012). "Psychological stress, immune response, and atherosclerosis." Atherosclerosis **223**(1): 69-77.

Guedda, M. (1989). Alternatives de développement des populations pastorales en République de Djibouti. Rome, Centre d'Etudes et de Recherche de Djibouti (CERD)**:** 73.

Guedda, M. A. and J. Godet (1984). Recherche sur l'intégration progressive du pastoralisme au phénomène de développement. Djibouti, République de Djibouti, Présidence de la République, Institut Supérieur d'Etudes et des Recherches Scientifiques et Techniques, Section Sciences humaines**:** 122.

Hammen, C. (2005). "Stress and depression." Annual Review of Clinical Psychology **1**: 293-319.

Hammond, L. and D. Maxwell (2002). "The Ethiopian crisis of 1999–2000: lessons learned, questions unanswered." Disasters **26**(3): 262-279.

Harrison, P. (2006). Postructuralist Theories. Approaches to Human Geography. S. Aitken and G. Valentine. London, SAGE Publications**:** pp. 122-135.

Hassen, A. (2008). Vulnerability to Drought Risk and Famine: Local Responses and External Interventions among the Afar of Ethiopia, a Study on the Aghini Pastoral Community. Department of Social Geography. Bayreuth, University of Bayreuth. **PhD:** 345.

Headey, D., A. S. Taffesse and L. You (2012). Enhancing Resilience in the Horn of Africa. IFPRI Discussion Paper 01176. Washington, DC, International Food Policy Research Institute**:** 34.

Heijmans, A. (2004). From Vulnerability to Empowerment. Mapping Vulnerability: Disasters, Development, and People. G. Bankoff, G. Frerks and D. Hilhorst. London, Earthscan**:** pp.115-127.

Hellström, T. (2007). "Critical infrastructure and systemic vulnerability: Towards a planning framework." Safety science **45**(3): 415-430.

Herbert, T. B. and S. Cohen (1993). "Stress and immunity in humans: a meta-analytic review." Psychosomatic medicine **55**(4): 364-379.

Herrmann, S. M. and C. F. Hutchinson (2005). "The changing contexts of the desertification debate." Journal of Arid Environments **63**(3): 538-555.

Herskovits, M. J. (1926). "The Cattle Complex in East Africa." American Anthropologist **28**(3): 494-528.

Hess, M. (2004). "'Spatial' relationships? Towards a reconceptualization of embedded ness." Progress in Human Geography **28**(2): 165-186.

Hesse, C. and J. MacGregor (2006). Pastoralism: drylands' invisible asset? Developing a framework for assessing the value of pastoralism in East Africa, International Institute for Environment and Development (IIED). **142:** 1-39.

Hewitt, K. (1983). The idea of calamity in a technocratic age. Interpretations of Calamity: From the Viewpoint of Human Ecology. K. Hewitt. London, Boston and Sydney, Allen & Unwin Publishers**:** pp.3-32.

Hilhorst, D. and G. Bankoff (2004). Introduction: Mapping Vulnerability. Mapping Vulnerability: Disasters, Development, and People. G. Bankoff, G. Frerks and D. Hilhorst. London, Earthscan**:** pp.1-9.

Hoefle, S. W. (2006). "Eliminating scale and killing the goose that laid the golden egg?" Transactions of the Institute of British Geographers **31**(2): 238-243.

Houmed, I. I. (2002). Indépendance, Démocratisation, Enjeux stratégiques à Djibouti. Paris, Editions L'Harmattan.

Hundie, B. (2006). "Property rights among Afar pastoralists of northeastern Ethiopia: Forms, changes and conflicts." Humboldt University of Berlin.

Iglesias, A., L. Garrote, A. Cancelliere, F. Cubillo and D. A. Wilhite (2009). Coping with Drought Risk in Agriculture and Water Supply Systems. New York, Springer.

Imbert-Vier, S. (2011). Tracer des frontières à Djibouti: Des territoires et des hommes aux XIXe et XXe siècles, KARTHALA Editions.

IMF (2000). IMF Completes First Review of Djibouti under PRGF-Supported Program and Approves US$ 3.6 Million Disbursement. Washington, External Relations Department, International Monetary Fund: 2.

IMF (2001a). IMF Completes Djibouti's Review Under the PRGF Arrangement and Approves US$5 Million Disbursement. Washington, External Relations Department, International Monetary Fund: 2.

IMF (2001b). Interim Poverty Reduction Strategy Paper: Joint Staff Assessment. Washington, International Development Association and International Monetary Fund: 8.

IMF (2002a). IMF Completes Third Review Under Djibouti's PRGF Arrangement and Approves US$6 Million Disbursement. Washington, External Relations Department, International Monetary Fund: 2.

IMF (2002b). Joint Staff Assessment of the PRSP Preparation Status Report. Washington, International Development Association and International Monetary Fund: 4.

IMF (2004a). Djibouti Joint Staff Assessment of the Poverty Reduction Strategy Paper. Washington, Staff of the International Monetary Fund and the International Development Association, International Monetary Fund: 14.

IMF (2004b). Djibouti Staff-Monitored Program. Washington, Middle East and Central Asia Department, International Monetary Fund: 64.

IMF (2007a). IMF Executive Board Concludes 2007 Article IV Consultation with Djibouti. Washington, External Relations Department, International Monetary Fund: 4.

IMF (2007b). Staff Report for the 2007 Article IV Consultation Discussions. Washington, International Monetary Funnd: 58.

IMF (2009a). IMF Executive Board Concludes 2008 Article IV Consultation with Djibouti. Washington, External Relations Department, International Monetary Fund: 5.

IMF (2009b). Joint Staff Advisory Note on the Poverty Reduction Strategy Paper. Washington, International Development Association and International Monetary Fund: 11.

IMF (2009c). Staff Report for the 2008 Article IV Consultation and Request for a Three-Year Arrangement Under the Poverty Reduction and Growth Facility. Washington, Middle East and Central Asia Department, International Monetary Fund**:** 101.

IMF (2010). First Review Under the Three-Year Arrangement Under the Poverty Reduction and Growth Facility, Request for Waivers of Nonobservance of Performance of Performance Criteria, and Modification of Performance Criteria. Washington, Middle East and Central Asia Department, International Monetary Fund**:** 45.

IMF (2011). IMF Executive Board Concludes 2010 Article IV Consultation with Djibouti. Washington, External Relations Department, International Monetary Fund**:** 4.

Ionescu, C., R. Klein, J. Hinkel, K. Kavi Kumar and R. Klein (2009). "Towards a Formal Framework of Vulnerability to Climate Change." Environmental Modeling and Assessment **14**(1): 1-16.

IPCC (2001). Chapter 10: Africa. IPCC WGI Third Assessment Report. Paris, Intergovernmental Panel on Climate Change**:** 1-46.

IRIN (2010). Djibouti: Widespread food gaps despite ongoing rains. Nairobi, United Nations Organization for the Coordination of Humanitarian Affarirs of the United Nations (UN-OCHA)**:** 1.

IRIN (2011). Horn & Eastern Africa: Drought highlights in 2011, United Nations Organization for the Coordination of Humanitarian Affarirs of the United Nations (UN-OCHA)**:** 1.

Isse, A. A. (2012). Etat des modes de vie des éleveurs face aux changements climatiques à Djibouti. Ecole Inter-Etats des Sciences et Médecine Vétérinaires (E.L.S.M.V.). Dakar, Sénégal, Université Cheikh Anta Diop de Dakar. **Doctorat Vétérinaire:** 140.

Jacobs, A. H. (1965). "African pastoralists: Some general remarks." Anthropological Quarterly **38**(3): 144-154.

Jalludin, M. and M. Razack (2004). "Assessment of hydraulic properties of sedimentary and volcanic aquifer systems under arid conditions in the Republic of Djibouti (Horn of Africa)." Hydrogeology Journal **12**(2): 159-170.

Jauch, H. (2009). How The IMF-World Bank and Structural Adjustment Program (SAP) Destroyed Africa. Namibia, News and Rescue**:** 1-13.

Jenkins, P. (2014). East Africa's refugee crisis compounds Djibouti's drought crisis. United Kingdom (UK), British Red Cross Society**:** 1.

Jonas, A. E. G. (2006). "Pro scale: Further reflections on the 'scale debate' in human geography." Transactions of the Institute of British Geographers **31**(3): 399-406.

Jones, J. P., K. Woodward and S. A. Marston (2007). "Situating Flatness." Transactions of the Institute of British Geographers **32**(2): 264-276.

Jones, M. (2009). "Phase space: Geography, relational thinking, and beyond." Progress in Human Geography **33**(4): 487-506.

Joseph, J. (2013). "Measuring vulnerability to natural hazards: A macro framework." Disasters **37**(2): 185-200.

Jufare, A. T. (2008). Livelihood Adaptation, Risks and Vulnerability in Rural Wolaita, Ethiopia. Department of International Environment and Development Studies. Oslo, Norwegian University of Life Sciences. **PhD:** i-vi, 1-154.

Jury, M. (2009). "Ethiopian decadal climate variability." Theoretical and Applied Climatology: 1-12.

Kandagor, D. (2005). Rethinking pastoralism and African development: A case study of the Horn of Africa. Nairobi, Kenya, Department of History, Egerton University**:** 15.

Kapteijns, L. (1995). "Gender relations and the transformation of the Northern Somali pastoral tradition." The International journal of African historical studies **28**(2): 241-259.

Kelemework Tafere Reda, D. (2012). "Pastoralism at Crossroads: Changing Features of Climate, Livelihood and Social Organization in East Africa." Global Journal of Human Social Science Research **12**(9-C).

Kent, S. (1991). "The shift to sedentism as viewed from a recently sedentary Kalahari village." Nyame Akuma **35**: 2-10.

Kienberger, S., T. Blaschke and R. Z. Zaidi (2013). "A framework for spatio-temporal scales and concepts from different disciplines: the 'vulnerability cube'." Natural Hazards **68**(3): 1343-1369.

Kipuri, N. and A. Ridgewell (2008). A Double Bind: The Exclusion of Pastoralist Women in the East and Horn of Africa, Minority Rights Group International**:** 1-36.

Kirkbride, M. and R. Grahn (2008). "Survival of the fittest: Pastoralism and climate change in East Africa." Oxfam Policy and Practice: Agriculture, Food and Land **8**(3): 174-220.

Kitchin, R. (2006). Positivistic Geographies and Spatial Science. Approaches to Human Geography. S. Aitken and G. Valentine. London, SAGE Publications**:** pp. 20-29.

Konczacki, Z. A. (1967). "Nomadism and Economic Development of Somalia: The Position of the Nomads in the Economy of Somalia." Canadian Journal of African Studies **1**(2): 163-175.

Krätli, S., C. Huelsebusch, S. Brooks and B. Kaufmann (2013). "Pastoralism: A critical asset for food security under global climate change." Animal Frontiers **3**(1): 42-50.

Krömker, D., F. Eierdanz and A. Stolberg (2008). "Who is susceptible and why? An agent-based approach to assessing vulnerability to drought." Regional Environmental Change **8**(4): 173-185.

Kurnik, B., P. Barbosa and J. Vogt (2011). "Testing two different precipitation datasets to compute the standardized precipitation index over the Horn of Africa." International Journal of Remote Sensing **32**(21): 5947-5964.

Lamkin, D. M., E. K. Sloan, A. J. Patel, B. S. Chiang, M. A. Pimentel, J. C. Ma, J. M. Arevalo, K. Morizono and S. W. Cole (2012). "Chronic stress enhances progression of acute lymphoblastic leukemia via β-adrenergic signaling." Brain, Behavior, and Immunity **26**(4): 635-641.

Latour, B. (2005). Reassembling the social: An introduction to actor-network-theory. Oxford, Oxford University Press.

Le Houérou, H. N. (1996). "Climate change, drought and desertification." Journal of Arid Environments **34**(2): 133-185.

Leach, M. and R. Mearns, Eds. (1996). The Lie of the Land: Challenging received wisdom on the African environment. Currey, Oxford, James Currey Ltd.

Leitner, H. and B. Miller (2007). "Scale and the limitations of ontological debate: A commentary on Marston, Jones and Woodward." Transactions of the Institute of British Geographers **32**(1): 116-125.

Lewis, I. M. (1961). "Notes on the Social Organisation of the Ise Somali." Rassegna di Studi Etiopici: 69-82.

Lewis, I. M. (2004). "Visible and invisible differences: The Somali paradox." Africa: Journal of the International African Institute **74**(4): 489-515.

Lindsay, J. R. (2003). "The Determinants of Disaster Vulnerability: Achieving Sustainable Mitigation through Population Health." Natural Hazards **28**(2): 291-304.

Lindtjørn, B., T. Alemu and B. Bjorvatn (1992). "Dietary pattern and state of nutrition among children in drought-prone areas of southern Ethiopia." Annals of tropical paediatrics **13**(1): 21-32.

Little, M. A. and S. J. Gray (1990). "Growth of young nomadic and settled Turkana children." Medical Anthropology Quarterly **4**(3): 296-314.

Little, M. A., S. J. Gray and P. W. Leslie (1993). "Growth of nomadic and settled Turkana infants of northwest Kenya." American journal of physical anthropology **92**(3): 273-289.

Little, P. D. (2003). "Rethinking interdisciplinary paradigms and the political ecology of pastoralism in East Africa." African Savannas: New Perspectives on Environmental and Social Change: 161-177.

Little, P. D., B. Cellarius, C. Barrett and D. L. Coppock (1999). Economic diversification and risk management among east African herders: A preliminary assessment and literature review. GL-CRSP Pastoral Risk Management Project Technical Report, Utah State University. **99:** 1-40.

Lloyd-Hughes, B. (2013). "The impracticality of a universal drought definition." Theoretical and Applied Climatology: 1-5.

Logan, I. B. and K. Mengisteab (1993). "IMF-World Bank adjustment and structural transformation in sub-Saharan Africa." Economic Geography: 1-24.

Lopez, C. and C. Racimora (2010). "La coordination nationale des ONG françaises de solidarité internationale." Retrieved October 2, 2010.

Lott, F. C., N. Christidis and P. A. Stott (2013). "Can the 2011 East African drought be attributed to human-induced climate change?" Geophysical Research Letters **40**(6): 1177-1181.

Louis, R. P. (2007). "Can You Hear us Now? Voices from the Margin: Using Indigenous Methodologies in Geographic Research." Geographical Research **45**(2): 130-139.

Loutan, L. and J. Lamotte (1984). "Seasonal variations in nutrition among a group of nomadic pastoralists in Niger." The Lancet **323**(8383): 945-947.

Lucini, D. and M. Pagani (2012). "From stress to functional syndromes: An internist's point of view." European journal of internal medicine **23**(4): 295-301.

Luers, A. L. (2005). "The surface of vulnerability: An analytical framework for examining environmental change." Global Environmental Change Part A **15**(3): 214-223.

Lupai, J. K. (2008). Household food security with reference to peasant farming in Birbirsa na Dogoma in Ambo District, Oromiya Region, Ethiopia. Department of Geography. London, University of London, School of Oriental and African Studies. **PhD:** 1-359.

Luseno, W. K., J. G. McPeak, C. B. Barrett, P. D. Little and G. Gebru (2003). "Assessing the value of climate forecast information for pastoralists: Evidence from Southern Ethiopia and Northern Kenya." World Development **31**(9): 1477-1494.

Mace, R., D. M. Anderson, T. Bierschenk, L. Cronk, I. Kohler-Rollefson, W. Lancaster, F. Lancaster, P. D. Little, E. A. Morris and J. Rossignol (1993). "Transitions Between Cultivation and Pastoralism in Sub-Saharan Africa [and Comments and Reply]." Current Anthropology **34**(4): 363-382.

MacKay, J., J. Levin, G. de Carvalho, K. Cavoukian and R. Cuthbert (2013). "Before and after borders: The nomadic challenge to sovereign territoriality." International Politics: 1-23.

Mahamoud, A., O. Laminou Manzo and P. Ozer (2013). Evolution récente des extrêmes pluviométriques et des températures à Djibouti. Climat, Agriculture et Ressources en eau d'hier à demain**:** 354-359.

MAPE-RH (2010). Plan Directeur de Développement du Secteur Primaire en République de Djibouti (2010-2020). Djibouti, Agence Turque de Coopération et de Développement (TIKA) et Gouvernement de Djibouti**:** 100.

Margolies, A. and J. Hoddinott (2012). Mapping the Impacts of Food Aid: Current Knowledge and Future Directions, World Institute for Development Economic Research (UNU-WIDER).

Marston, S. A., J. P. Jones and K. Woodward (2005). "Human geography without scale." Transactions of the Institute of British Geographers **30**(4): 416-432.

Massey, D. (2005). For space. London, Thousand Oaks, New Delhi, SAGE Publications.

Maxwell, D., R. Caldwell and M. Langworthy (2008). "Measuring food insecurity: Can an indicator based on localized coping behaviors be used to compare across contexts?" Food Policy **33**(6): 533-540.

McLaughlin, P. and T. Dietz (2008). "Structure, agency and environment: Toward an integrated perspective on vulnerability." Global Environmental Change **18**(1): 99-111.

MEFPP (2005). Bilan 1999-2004 de l'Ajustement au Développement. Djibouti, Ministère de L'Economie des Finances et de la Planification chargé de la Privatisation, Gouvernement de Djibouti**:** 69.

Meier, P., D. Bond and J. Bond (2007). "Environmental influences on pastoral conflict in the Horn of Africa." Political Geography **26**(6): 716-735.

Mercer, J., D. Dominey-Howes, I. Kelman and K. Lloyd (2007). "The potential for combining indigenous and western knowledge in reducing vulnerability to environmental hazards in small island developing states." Environmental Hazards **7**(4): 245-256.

META (1999). Rapport National à la Conférence des parties à la Convention sur la Diversité Biologique. Djibouti, Direction de l'Environnement, Ministère de l'Environnement, du Tourisme et de l'Artisanat**:** 28.

Meze-Hausken, E. (2004). "Contrasting climate variability and meteorological drought with perceived drought and climate change in northern Ethiopia." Climate Research **27**(1): 19-31.

MHUEAT (2001). Communication Nationale Initiale de la République de Djibouti à la Convention Cadre des Nations Unies sur les Changements Climatiques. Djibouti, Ministère de l'Habitat de l'Urbanisme de l'Environnement et de l'Aménagement du Territoire, Gouvernement de Djibouti**:** 83.

MID (2009). Plan de Developpement Regional (PDR/Dikhil). Djibouti, Ministère de l'Intérieur et de la Décentralisation, Gouvernment de Djibouti**:** 21.

MID (2010). Evaluation rapide de l'impact de la sécheresse en milieu rural. Djibouti, Ministère de l'Intérieur et de la Décentralisation, Gouvernement de Djibouti et Partenaires**:** 19.

MID and ONARS (2006). Evaluation multisectorielle de l'impact de la sécheresse à Djibouti. Djibouti, Ministère de l'Intérieur et de la Décentralisation et Office National d'Assistance aux Réfugiés et Sinistrés, Gouvernement de Djibouti**:** 54.

Miller, F., H. Osbahr, E. Boyd, F. Thomalla, S. Bharwani, G. Ziervogel, B. Walker, J. Birkmann, S. van der Leeuw and J. Rockström (2010). "Resilience and vulnerability: complementary or conflicting concepts?" Ecology and Society **15**(3).

Minamiguchi, N. (2005). The application of geospatial and disaster information for food insecurity and agricultural drought monitoring and assessment by the FAO GIEWS and Asia FIVIMS. Reducing Food Insecurity Associated with Natural Disasters in Asia and the Pacific, Bangkok, Thailand.

Mishra, A. K. and V. P. Singh (2010). "A review of drought concepts." Journal of Hydrology **391**(1): 202-216.

Mkutu, K. (2001). Pastoralism and conflict in the Horn of Africa. United Kingdom (UK), Africa Peace Forum, Saferworld, University of Bradford**:** 45.

Mohamed Ahmed, S. (2005). A Cry for Life: Understanding the Risk Factors Somali Pastoral Women face in Northern Kenya. Leiden, Leiden University**:** 1-21.

Mohamed, J. (2004). "The political ecology of colonial Somaliland." Africa **74**(4): 534-566.

Mohamed, N. (2006). Pastoralism as a conservation strategy and contributing towards livelihood security and improvement, United Nations Development Programme-Global

Environment Facility (UNDP-GEF) and the International Union for Conservation of Nature (IUCN)**:** 73.

Morrow, B. H. (1999). "Identifying and mapping community vulnerability." Disasters **23**(1): 1-18.

Moseley, W. G. (2012). "Famine Myths: Five Misunderstandings Related to the 2011 Hunger Crisis in the Horn of Africa." Dollars and Sense: 17-21.

Murdoch, J. (1997). "Towards a geography of heterogeneous associations." Progress in Human Geography **21**(3): 321-337.

Murdoch, J. (1998). "The spaces of actor-network theory." Geoforum **29**(4): 357-374.

Murdoch, J. (2000). "Networks -- a new paradigm of rural development?" Journal of Rural Studies **16**(4): 407-419.

Murdoch, J. (2006). Post-structuralist geography: A guide to relational space. London, SAGE Publications.

Mustafa, D. (2003). "Reinforcing vulnerability? Disaster relief, recovery, and response to the 2001 flood in Rawalpindi, Pakistan." Global Environmental Change Part B: Environmental Hazards **5**(3-4): 71-82.

Mustafa, D., E. Saroch and T. R. t. R. S. Team (2008). Pinning Down Vulnerability: From Narratives to Numbers. From Risk to Resilience Working Paper No. 2. M. Moench, E. Caspari and A. Pokhrel. Kathmandu, Nepal, ISET-Nepal and ProVention**:** 28

Næss, M. W. (2012). "Cooperative Pastoral Production: Reconceptualizing the Relationship between Pastoral Labor and Production." American Anthropologist **114**(2): 309-321.

Næss, M. W. and B.-J. Bårdsen (2010). "Environmental stochasticity and long-term livestock viability—herd-accumulation as a risk reducing strategy." Human Ecology **38**(1): 3-17.

Næss, M. W. and B.-J. Bårdsen (2013). "Why Herd Size Matters – Mitigating the Effects of Livestock Crashes." PLoS ONE **8**(8): 1-7.

Naiman, R. and N. Watkins (1999). A Survey of the Impacts of IMF Structural Adjustment in Africa: Growth, Social Spending, and Debt Relief, Preamble Center, April.

Nathan, M. A., E. M. Fratkin and E. A. Roth (1996). "Sedentism and child health among Rendille pastoralists of northern Kenya." Social Science & Medicine **43**(4): 503-515.

Nduma, I., P. Kristjanson and J. McPeak (2001). "Diversity in income-generating activities for sedentarized pastoral women in northern Kenya." Human Organization **60**(4): 319-325.

Nelson, F. (2012). "Natural conservationists? Evaluating the impact of pastoralist land use practices on Tanzania's wildlife economy." Pastoralism **2**(1): 1-19.

Nightingale, A. (2006). Can Social Theory Adequately Address Nature-Society Issues? Do political ecology and science studies in Geography incorporate ecological change? Third International Critical Geography Conference. Békéscsaba, Hungary, Institute of Geography, School of GeoSciences, University of Edimburgh**:** 1-20.

Nisar, M. (2010). "Livestock Trade in the Djibouti, Somali and Ethiopian Borderlands." Africa Programme(2010/01): 1-16.

Nori, M., M. Taylor and A. Sensi (2008). Browsing on fences: Pastoral land rights, livelihoods and adaptation to climate change, International Institute for Environment and Development**:** 1-28.

Notaro, M., Z. Liu and J. W. Williams (2006). "Observed Vegetation–Climate Feedbacks in the United States." Journal of Climate **19**(5): 763-786.

Nugent, J. B. and N. Sanchez (1993). "Tribes, chiefs, and transhumance: A comparative institutional analysis." Economic Development and Cultural Change **42**(1): 87-113.

Nyssen, J., M. Haile, J. Naudts, N. Munro, J. Poesen, J. Moeyersons, A. Frankl, J. Deckers and R. Pankhurst (2009). "Desertification? Northern Ethiopia re-photographed after 140 years." Science of The Total Environment **407**(8): 2749-2755.

Nyssen, J., H. Vandenreyken, J. Poesen, J. Moeyersons, J. Deckers, M. Haile, C. Salles and G. Govers (2005). "Rainfall erosivity and variability in the Northern Ethiopian Highlands." Journal of Hydrology **311**(1-4): 172-187.

O'Brien, K. and R. Leichenko (2008). Human Security, Vulnerability and Sustainable Adaptation. Human Development Report, United Nations Development Programme (UNDP)**:** 47.

O'Keefe, P., K. Westgate and B. Wisner (1976). "Taking the naturalness out of natural disasters." Nature **260**: pp.566-567.

Oba, G. (2011). Mobility and the Sustainability of the Pastoral Production system in Africa: Perspectives of Contrasting Paradigms. International Conference on the Future of Pastoralism. Addis Abeba, Ethiopia**:** 1-21.

Oberlé, P. and P. Hugot (1985). Histoire de Djibouti: des origines à la République, Présence africaine.

Oliver-Smith, A. (2004). Theorizing Vulnerability in a Globalized World: A Political Ecological Perspective. Mapping Vulnerability: Disasters, Development, and People. G. Bankoff, G. Frerks and D. Hilhorst. London, Earthscan**:** pp.10-24.

Omondi, P. A. o., J. L. Awange, E. Forootan, L. A. Ogallo, R. Barakiza, G. B. Girmaw, I. Fesseha, V. Kululetera, C. Kilembe, M. M. Mbati, M. Kilavi, S. M. King'uyu, P. A. Omeny, A. Njogu, E. M. Badr, T. A. Musa, P. Muchiri, D. Bamanya and E. Komutunga (2014). "Changes in temperature and precipitation extremes over the Greater Horn of Africa region from 1961 to 2010." International Journal of Climatology **34**(4): 1262-1277.

Ouma, C., J. Obando and M. Koech (2012). "Post Drought recovery strategies among the Turkana pastoralists in Northern Kenya."

Ozer, P. and A. Mahamoud (2013). "Recent Extreme Precipitation and Temperature Changes in Djibouti City (1966–2011)." Journal of Climatology **2013**: 1-8.

Patrick Webb (1993). "Coping with Drought and Food Insecurity in Ethiopia." Disasters **17**(1): 33-47.

Pelling, M. (2001). Natural Disasters? Social Nature: Theory, Practice, and Politics. N. Castree and B. Braun. Malden and Oxford, Blackwell Publishers**:** pp.170-188.

Pelling, M. (2003). Paradigms of risk. Natural Disasters and Development in a Globalizing World. M. Pelling. London and New York, Routledge**:** pp.3-16.

Piguet, F. (1998). Des nomades entre la ville et les sables: la sédentarisation dans la Corne de l'Afrique. Paris, Karthala, IUED.

PreventionWeb (2008). Djibouti: Disaster Statistics, EM-DAT: The OFDA/CRED International Disaster Database, Université catholique de Louvain, Brussels, Belgium.

Pricope, N. G., G. Husak, D. Lopez-Carr, C. Funk and J. Michaelsen (2013). "The climate-population nexus in the East African Horn: Emerging degradation trends in rangeland and pastoral livelihood zones." Global Environmental Change **23**(6): 1525-1541.

Rabeh, O. O. (1989). "Les conditions fondamentales de l'existence et du progrès de la nation somalie." Mondes en développement **17**(66): 93-106.

Ragin, C. C. (2000). Fuzzy-set social science, University of Chicago Press.

Rauken, T. and I. Kelman (2010). "River flood vulnerability in Norway through the pressure and release model." Journal of Flood Risk Management **3**(4): 314-322.

Renders, M. (2007). "Appropriate 'Governance-Technology'? Somali Clan Elders and Institutions in the Making of the'Republic of Somaliland'." Africa Spectrum: 439-459.

Rettberg, S. (2010). "Contested narratives of pastoral vulnerability and risk in Ethiopia's Afar region." Pastoralism **1**(2): 248-273.

Robbins, P. and K. Monroe Bishop (2008). "There and back again: Epiphany, disillusionment, and rediscovery in political ecology." Geoforum **39**(2): 747-755.

Rosenfeld, D., Y. Rudich and R. Lahav (2001). "Desert dust suppressing precipitation: A possible desertification feedback loop." Proceedings of the National Academy of Sciences **98**(11): 5975-5980.

Roux, K. (2011). Drought takes hold in Djibouti. Djibouti, International Federation of Red Cross and Red Crescent Societies (IFRC)**:** 1.

Ruming, K. (2009). "Following the Actors: Mobilising an actor-network theory methodology in geography." Australian Geographer **40**(4): 451-469.

Salzman, P. C. (1967). "Political organization among nomadic peoples." Proceedings of the American Philosophical Society **111**(2): 115-131.

Sapountzaki, K. (2012). "Vulnerability management by means of resilience." Natural Hazards **60**(3): 1267-1285.

Sayre, N. F. (2009). Scale. A Companion to Environmental Geography. N. Castree, D. Demeritt, D. Liverman and B. Rhoads. Kingston, Blackwell and Wiley**:** pp. 95-108.

Schelling, E., S. Daoud, D. Daugla, P. Diallo, M. Tanner and J. Zinsstag (2005). "Morbidity and nutrition patterns of three nomadic pastoralist communities of Chad." Acta tropica **95**(1): 16-25.

Schmidt-Thomé, P., Ed. (2006). Natural and technological hazards and risks affecting the spatial development of European Regions. Management of Environmental Quality: An International Journal. Espoo, Geological Survey of Finland (GTK).

Schneiderbauer, S. (2007). Risk and Vulnerability to Natural Disasters: From Broad View to Focused Perspective - Theoretical background and applied methods for the identification of the most endangered populations in two case studies at different scales. Berlin, Free University of Berlin. **PhD:** 140.

Schneiderbauer, S. and D. Ehrilch (2004). Risk, hazard and people's vulnerability to natural hazards: A review of definitions, concepts and data. Luxembourg, European Commission**:** 41.

Schwartz, H. J. (2005). Ecological and economic consequences of reduced mobility in pastoral livestock production systems. As Pastoralists Settle: Social, Health, and Economic Consequences of Pastoral Sedentarization in Marsabit District, Kenya. E. Fratkin and E. A. Roth. New York, USA, Springer**:** 69-86.

Scoones, I. (1995). "Living with uncertainty: new directions in pastoral development in Africa." Development in Practice **4**(3): 188-198.

Scoones, I. and O. Graham (1994). "New directions for pastoral development in Africa." Development in Practice **4**(3): 188-198.

Seaman, J., J. Holt, J. Rivers and J. Murlis (1973). "An inquiry into the drought situation in Upper Volta." The Lancet **302**(7832): 774-778.

Segele, Z. T. and P. J. Lamb (2005). "Characterization and variability of Kiremt rainy season over Ethiopia." Meteorology and Atmospheric Physics **89**(1): 153-180.

Segele, Z. T., P. J. Lamb and L. M. Leslie (2009). "Large-scale atmospheric circulation and global sea surface temperature associations with Horn of Africa June-September rainfall." International Journal of Climatology **29**(8): 1075-1100.

Seleshi, Y. and U. Zanke (2004). "Recent changes in rainfall and rainy days in Ethiopia." International Journal of Climatology **24**(8): 973-983.

Sellen, D. W. (1996). "Nutritional status of Sub-Saharan African pastoralists: A review of the literature." Nomadic Peoples **39**: 107-134.

Sellen, D. W. (2000). "Seasonal ecology and nutritional status of women and children in a Tanzanian pastoral community." American Journal of Human Biology **12**(6): 758-781.

Sheik-Abdi, A. (1977). "Somali nationalism: Its origins and future." The Journal of Modern African Studies **15**(04): 657-665.

Sheik-Mohamed, A. and J. P. Velema (1999). "Where health care has no access: The nomadic populations of sub-Saharan Africa." Tropical medicine & international health **4**(10): 695-707.

Shell-Duncan, B. and W. Obungu Obiero (2000). "Child nutrition in the transition from nomadic pastoralism to settled lifestyles: Individual, household, and community-level factors." American journal of physical anthropology **113**(2): 183-200.

Shongwe, M. E., G. J. van Oldenborgh, B. van den Hurk and M. van Aalst (2011). "Projected Changes in Mean and Extreme Precipitation in Africa under Global Warming. Part II: East Africa." Journal of Climate **24**(14): 1-40.

Silah-Eddine, A. S. (2011). Bilan Commun de Pays (CCA). Djibouti, Gouvernement de Djibouti et Système des Nations Unies**:** 90.

Simel, J. O. (2010). "Le pastoralisme et les défis du changement climatique." Pasteurs Nomades et Transhumants Autochtones: 61.

Singh, A., N. Hossain, T. Foresman and M. Cheatle (2002). Assessing Human vulnerability to environmental change: Concepts, Issues, Methods and Case-studies, UNEP-DEWA**:** 57.

Singh, N. P., C. Bantilan and K. Byjesh (2014). "Vulnerability and policy relevance to drought in the semi-arid tropics of Asia – A retrospective analysis." Weather and Climate Extremes: 1-8.

Slegers, M. F. W. and L. Stroosnijder (2008). "Beyond the Desertification Narrative: A Framework for Agricultural Drought in Semi-arid East Africa." AMBIO: A Journal of the Human Environment **37**(5): 372-380.

Smit, B. and J. Wandel (2006). "Adaptation, adaptive capacity and vulnerability." Global Environmental Change **16**(3): 282-292.

Smith, K., Ed. (2001). Environmental hazards: Assessing risk and reducing disaster. Routledge Physical Environment. London and New York, Routledge.

Smith, K., C. B. Barrett and P. W. Box (2000). "Participatory risk mapping for targeting research and assistance: With an example from East African pastoralists." World Development **28**(11): 1945-1959.

Soares, M. B., A. S. Gagnon and R. M. Doherty (2012). "Conceptual elements of climate change vulnerability assessments: a review." International Journal of Climate Change Strategies and Management **4**(1): 6-35.

Stewart, F. and M. Wang (2004). "Do PRSPs empower poor countries and disempower the World Bank, or is it the other way round?" Globalization and the Nation State(108): 1-32.

Stroosnijder, L. (2007). Rainfall and Land Degradation. Climate and Land Degradation. M. V. K. Sivakumar and N. Ndiang'ui. Berlin Heidelberg, Springer 167-195.

Sumner, A. and R. Mallett (2013). "Capturing Multidimensionality: What does a Human Wellbeing Conceptual Framework Add to the Analysis of Vulnerability?" Social indicators research **113**(2): 671-690.

Taenzler, D., A. Carius and A. Maas (2008). "Assessing the susceptibility of societies to droughts: a political science perspective." Regional Environmental Change **8**(4): 161-172.

Tafere Reda, K. (2012). "Pastoralism at Crossroads: Changing Features of Climate, Livelihood and Social Organization in East Africa." Global Journal of Human-Social Science Research **12**(9-C): 1-5.

Taubenböck, H., J. Post, A. Roth, K. Zosseder, G. Strunz and S. Dech (2008). A conceptual vulnerability and risk framework as outline to identify capabilities of remote sensing, Published by Copernicus Publications on behalf of the European Geosciences Union.

Taylor, C. M., E. F. Lambin, N. Stephenne, R. J. Harding and R. L. Essery (2002). "The influence of land use change on climate in the Sahel." Journal of Climate **15**(24): 3615-3629.

Thompson, V. M. and R. Adloff (1968). Djibouti and the Horn of Africa, Stanford University Press.

Tierney, J. E., J. E. Smerdon, K. J. Anchukaitis and R. Seager (2013). "Multidecadal variability in East African hydroclimate controlled by the Indian Ocean." Nature **493**(7432): 389-392.

Tilahun, K. (2006). "The characterization of rainfall in the arid and semi-arid regions of Ethiopia." Water SA **32**(3): 429-436.

Torry, W. I. (1976). "Residence rules among the Gabra nomads: some ecological considerations." Ethnology **15**(3): 269-285.

Tran, M. (2011). Djibouti: the forgotten country in the Horn of Africa crisis. United Kingdom (UK), The Guardian**:** 1.

Tsakiris, G., I. Nalbantis, H. Vangelis, B. Verbeiren, M. Huysmans, B. Tychon, I. Jacquemin, F. Canters, S. Vanderhaegen and G. Engelen (2013). "A system-based paradigm of drought analysis for operational management." Water Resources Management **27**(15): 5281-5297.

Tsasis, P. (2008). "Vulnerability and risk perception in the management of HIV/AIDS: Public priorities in a global pandemic." Risk management and healthcare policy **1**: 7-14.

Turner, B. L., R. E. Kasperson, P. A. Matson, J. J. McCarthy, R. W. Corell, L. Christensen, N. Eckley, J. X. Kasperson, A. Luers, M. L. Martello, C. Polsky, A. Pulsipher and A. Schiller (2003). "A framework for vulnerability analysis in sustainability science." Proceedings of the National Academy of Sciences of the United States of America **100**(14): 8074-8079.

UN (2012). Djibouti Consolidated Appeal: Mid-Year Review. Djibouti, United Nations**:** 52.

UN (2013). Djibouti Appel Global 2013. Djibouti, United Nations**:** 78.

UNDP (2011). Project Document. Djibouti, United Nations Development Programme, United Nations**:** 40.

UNOCHA-PCI (2006). Is Pastoralism Still Viable in the Horn of Africa? New Perspectives from Ethiopia. Addis Ababa, Ethiopia, United Nations Office for the Coordination of Humanitarian Affairs**:** 2.

Verón, S. R., J. M. Paruelo and M. Oesterheld (2006). "Assessing desertification." Journal of Arid Environments **66**(4): 751-763.

Vetter, S. (2005). "Rangelands at equilibrium and non-equilibrium: Recent developments in the debate." Journal of Arid Environments **62**(2): 321-341.

Villagrán, J. C. D. L. (2006). Vulnerability: A conceptual and methodological review. Bonn, United Nations University (UNU-EHS)**:** 66.

Vinet, F., J. A. Adi, J.-P. Cherel, A. Colas, M. Pasquet and X. Gutherz (2012). Rapport sur les crues de l'oued Gobaad à As Eyla (République de Djibouti, Août 2010): Processus, Impacts et Remédiation. Djibouti, Université Montpellier 3/Sud Hémisphère**:** 95.

Vrba, J. and A. R. Salamat (2006). Groundwater for Emergency Situations, Tehran, United Nations Educational, Scientific and Cultural Organization (UNESCO).

Walters, B. and A. Vayda (2009). "Event Ecology, Causal Historical Analysis, and Human-Environment Research." Annals of the Association of American Geographers **99**: 534-553.

Watts, M. J. (1983). Silent Violence: Food, Famine and Peasantry in Northern Nigeria. Berkeley, University of California Press.

Watts, M. J. (2000). Struggles over Geography: violence, freedom, and development. Hettner Lectures No.3, Heidelberg, Department of Geography, University of Heidelberg.

Watts, M. J. and R. Peet (2004). Liberating political ecology. Liberation Ecologies: Environment, Development, Social movements. R. Peet and M. J. Watts. London, Routledge**:** 444.

Webb, P. and J. Von Braun (1994). Famine and Food Security: Lessons for Africa. Chichester, John Wiley & Sons Ltd.

WFP (2008). Djibouti Rapid Emergency Food Security Assessment (May 2008). Djibouti, World Food Programme (WFP)**:** 38.

WFP (2009). Djibouti Emergency Food Security Assessment (May 2009). Djibouti, World Food Programme (WFP)**:** 35.

WFP (2010). Djibouti Emergency Food Security Assessment (July 2010). Djibouti, World Food Programme (WFP)**:** 25.

WFP (2011). Djibouti Emergency Food Security Assessment (August 2011). Djibouti, World Food Programme (WFP)**:** 44.

WFP (2012). Djibouti Emergency Food Security Assessment in Rural Areas (July 2012). Djibouti, World Food Programme (WFP)**:** 66.

WFP (2013). Evaluation de la Sécurité Alimentaire en Situation d'Urgence en Zone Rurale en République de Djibouti (Juillet 2013). Djibouti, World Food Programme (WFP)**:** 71.

White, P., M. Pelling, K. Sen, D. Seddon, S. Russell and R. Few (2004). Disaster risk reduction: a development concern. A scoping study on links between disaster risk reduction, poverty and development. London, Department for International Development (DFID)**:** 74.

Whittaker, H. (2012). "Forced Villagization during the Shifta Conflict in Kenya, ca. 1963–1968." The International journal of African historical studies **45**(3): 343-364.

Widstrand, C. G. (1975). "The rationale of nomad economy." AMBIO, VOL. 4, NO. 4, P 146-153, 1975. 3 FIG, 12 REF.

Wilcox, B. P., M. G. Sorice and M. H. Young (2011). "Dryland ecohydrology in the anthropocene: taking stock of human–ecological interactions." Geography Compass **5**(3): 112-127.

Wilhite, D. A. (2005). Drought and water crises: Science, technology, and management issues, Taylor and Francis.

Wilhite, D. A. and M. H. Glantz (1985). "Understanding the Drought Phenomenon: The Role of Definitions." Water International **10**(3): 111-120.

Wilhite, D. A. and M. H. Glantz (1987). Understanding the Drought Phenomenon: The Role of Definitions. Planning for Drought: Toward a Reduction of Societal Vulnerability. D. A. Wilhite, W. E. Easterling and D. A. Wood. Boulder and London, Westview Press**:** 597.

Williams, A. P., C. Funk, J. Michaelsen, S. A. Rauscher, I. Robertson, T. H. G. Wils, M. Koprowski, Z. Eshetu and N. J. Loader (2012). "Recent summer precipitation trends in the Greater Horn of Africa and the emerging role of Indian Ocean sea surface temperature." Climate dynamics **39**(9-10): 2307-2328.

Wisner, B. (2001). From Soup to Taxonomy, then to Analysis and finally Tool. Vulnerability in Disaster Theory and Practice. Disaster Studies of Wageningen University and Research Centre, Oberlin College**:** pp.1-26.

Wisner, B. (2003). Changes in capitalism and global shifts in the distribution of hazard and vulnerability. Natural Disasters and Development in a Globalizing World. M. Pelling. London and New York, Routledge**:** pp.43-56.

Wisner, B., P. Blaikie, T. Cannon and I. Davis (2004). At risk: Natural hazards, people's vulnerability and disasters. London and New York, Routledge.

Wolde-Mariam, M. (1986). Rural vulnerability to famine in Ethiopia, 1958-1977. London :, Intermediate Technology Publications.

Yaro, J. A. (2004). "Theorizing food insecurity: Building a livelihood vulnerability framework for researching food insecurity." Norsk Geografisk Tidsskrift - Norwegian Journal of Geography **58**(1): 23 - 37.

Yasin, Y. M. (2010). Trans-Border Political Alliance in the Horn of Africa: The Case of the Afar-Issa Conflict. Borders and Borderlands as Resources in the Horn of Africa. D. Feyissa and M. V. Hoehne. Woodbridge, Boydell & Brewer**:** 85-96.

Yasir, A. (2009). "The political economy of disaster vulnerability: A case study of Pakistan earthquake 2005." Munich Personal RePEc Archive (MPRA)(20762): 1-44.

Zhang, X., L. Alexander, G. C. Hegerl, P. Jones, A. K. Tank, T. C. Peterson, B. Trewin and F. W. Zwiers (2011). "Indices for monitoring changes in extremes based on daily temperature and precipitation data." Wiley Interdisciplinary Reviews: Climate Change **2**(6): 851-870.

## Appendix 1 - Guiding questions for the semi-structured interviews in Sankal

| Number | Questions |
|---|---|
| **1** | How many droughts have you experienced? |
| **2** | When was the worst drought and why? |
| **3** | What are some of the main consequences of drought that come back again and again? |
| **4** | What are the three worst consequences of drought? |
| **5** | When do you know that a drought is starting? |
| **6** | When did you arrive in Sankal? Where were you before? |
| **7** | How were you living before coming to Sankal? |
| **8** | How would you deal with droughts before? |
| **9** | What would you do if you or your children fell sick? Have you lost any children? |
| **10** | Would you help each other before? |
| **11** | Do you still help each other in the settlement? |
| **12** | Do you have any remaining assets and/or animals? |
| **13** | What main foods do you consume? |
| **14** | Where do you get the water and who brings it? |
| **15** | How do you survive droughts today? |
| **16** | How many kids do you have? |
| **17** | Is there anything you would like to add? |

*Source: Author's research*

80 household heads were interviewed in Sankal.

## Appendix 2 - Structured interview questionnaire for the CSI in Hanlé 2

| Number | Coping strategies | Consensus Severity Score |
|---|---|---|
| **1** | Eating at neighbours' house | S1 |
| **2** | Agriculture for auto-subsistence | S1.5 |
| **3** | Spending entire day(s) without eating | S1.5 |
| **4** | Borrowing lactating female livestock | S2 |
| **5** | Selling agricultural parcels | S2 |
| **6** | Selling lactating/reproductive livestock females | S2.5 |
| **7** | Selling genitor livestock males | S2.5 |
| **8** | Consuming cheaper less preferred foods | S2.5 |
| **9** | Borrowing food from neighbours | S2.5 |
| **10** | Sending household members to work in the city | S2.5 |
| **11** | Reducing the number of meals per day | S3 |
| **12** | Reducing the quantity of food per meal | S3 |
| **13** | Buying food on credit | S3 |

*Source: Author's research in collaboration with ACF*

100 Household heads were interviewed in Hanlé 2. The recall period corresponded to seven days.

## Appendix 3 - Structured interview questionnaire for the CSI in Koutabouya

| Number | Coping strategies | Consensus Severity score |
|---|---|---|
| **1** | Reducing the number of meals per day | S1 |
| **2** | Gathering wild foods | S1 |
| **3** | Solidarity between next of kin | S1 |
| **4** | Spending entire days without eating | S1.5 |
| **5** | Reducing the amount of food per meal | S1.5 |
| **6** | Purchasing food on credit | S1.5 |
| **7** | Selling genitor livestock males | S2 |
| **8** | Eating at neighbours' house | S3 |
| **9** | Borrowing lactating livestock females | S2 |
| **10** | Sending household members to work in the city | S2 |
| **11** | Consuming cheaper less preferred foods | S2.5 |
| **12** | Selling lactating/reproductive livestock females | S3 |
| **13** | Borrowing food from the neighbours | S3 |
| **14** | Sending household members to eat elsewhere | S3 |

*Source: Author's research in collaboration with ACF*

100 Household heads were interviewed in Koutabouya. The recall period corresponded to seven days.

## Appendix 4 - Structured interview questionnaire for the CSI in Dadahalou

| Number | Coping strategies | Consensus Severity score |
|---|---|---|
| **1** | Consuming cheaper less preferred foods | S1 |
| **2** | Lactating or pregnant women consuming inadequate foods | S1 |
| **3** | Entire family eating together at the same time | S1 |
| **4** | Selling charcoal and heating wood for food | S1 |
| **5** | Lactating or pregnant women consuming the same food as the rest of the family | S2 |
| **6** | Borrowing food from kin, friends or neighbours | S2.5 |
| **7** | Reducing children's food portions | S2.5 |
| **8** | Adults eating less to provide more for children | S2.5 |
| **9** | Selling household assets to buy more nutritious foods | S2.5 |
| **10** | Reducing meal portions | S3 |
| **11** | Reducing the number of meals per day | S3 |
| **12** | Spending entire day(s) without eating | S3 |

*Source: Author's research in collaboration with ACF*

100 Household heads were interviewed in Dadahalou. The recall period corresponded to seven days.

## Appendix 5 - Structured interview questionnaire for the CSI in Bondora

| Number | Coping strategies | Consensus Severity score |
|---|---|---|
| **1** | Lactating or pregnant women consuming inadequate foods | S1 |
| **2** | The entire family eating at the same time | S1 |
| **3** | Consuming cheaper less preferred foods | S2 |
| **4** | Borrowing foods from kin, friends or neighbours | S2 |
| **5** | Lactating or pregnant women consuming the same food as the rest of the family | S2 |
| **6** | Selling charcoal or heating wood to get money for food | S2 |
| **7** | Reducing the quantity of food per meal | S3 |
| **8** | Adults consuming less food to provide more for children | S3 |
| **9** | Reducing the number of meals per day | S3 |
| **10** | Reducing children's food portions | S3 |
| **11** | Spending entire day(s) without eating | S3 |
| **12** | Selling household assets to consume better foods | S3 |

*Source: Author's research in collaboration with ACF*

97 Household heads were interviewed in Bondora. The recall period corresponded to seven days.

## Appendix 6 - Spearman's correlation test results on decadal rainfall between Ali-Sabieh, Dikhil, Djibouti, Obock and Tadjoura regions (2007-2013)

| | | Quantity of decadal rainfall in Ali-Sabieh | Quantity of decadal rainfall in Dikhil | Quantity of decadal rainfall in Djibouti | Quantity of decadal rainfall in Obock | Quantity of decadal rainfall in Tadjoura |
|---|---|---|---|---|---|---|
| Quantity of decadal rainfall in Ali-Sabieh | Correlation Coefficient | 1.000 | .876** | .860** | .743** | .832** |
| | Sig. (2-tailed) | . | .000 | .000 | .000 | .000 |
| | N | 252 | 252 | 252 | 252 | 252 |
| Quantity of decadal rainfall in Dikhil | Correlation Coefficient | .876** | 1.000 | .831** | .783** | .900** |
| | Sig. (2-tailed) | .000 | . | .000 | .000 | .000 |
| | N | 252 | 252 | 252 | 252 | 252 |
| Quantity of decadal rainfall in Djibouti | Correlation Coefficient | .860** | .831** | 1.000 | .800** | .825** |
| | Sig. (2-tailed) | .000 | .000 | . | .000 | .000 |
| | N | 252 | 252 | 252 | 252 | 252 |
| Quantity of decadal rainfall in Obock | Correlation Coefficient | .743** | .783** | .800** | 1.000 | .830** |
| | Sig. (2-tailed) | .000 | .000 | .000 | . | .000 |
| | N | 252 | 252 | 252 | 252 | 252 |
| Quantity of decadal rainfall in Tadjoura | Correlation Coefficient | .832** | .900** | .825** | .830** | 1.000 |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | . |
| | N | 252 | 252 | 252 | 252 | 252 |

**. Correlation is significant at the 0.01 level (2-tailed).

*Source: The raw data were extracted from the GIEWS database, compiled and analysed by the author*

## Appendix 7 - Spearman's correlation test results on monthly rainfall between Ali-Sabieh, Dikhil, Djibouti, Obock and Tadjoura regions (2007-2013)

| | | Quantity of monthly rainfall in Ali-Sabieh | Quantity of monthly rainfall in Dikhil | Quantity of monthly rainfall in Djibouti | Quantity of monthly rainfall in Obock | Quantity of monthly rainfall in Tadjoura |
|---|---|---|---|---|---|---|
| Quantity of monthly rainfall in Ali-Sabieh | Correlation Coefficient | 1.000 | .936** | .930** | .811** | .920** |
| | Sig. (2-tailed) | . | .000 | .000 | .000 | .000 |
| | N | 84 | 84 | 84 | 84 | 84 |
| Quantity of monthly rainfall in Dikhil | Correlation Coefficient | .936** | 1.000 | .897** | .831** | .938** |
| | Sig. (2-tailed) | .000 | . | .000 | .000 | .000 |
| | N | 84 | 84 | 84 | 84 | 84 |
| Quantity of monthly rainfall in Djibouti | Correlation Coefficient | .930** | .897** | 1.000 | .831** | .892** |
| | Sig. (2-tailed) | .000 | .000 | . | .000 | .000 |
| | N | 84 | 84 | 84 | 84 | 84 |
| Quantity of monthly rainfall in Obock | Correlation Coefficient | .811** | .831** | .831** | 1.000 | .888** |
| | Sig. (2-tailed) | .000 | .000 | .000 | . | .000 |
| | N | 84 | 84 | 84 | 84 | 84 |
| Quantity of monthly rainfall in Tadjoura | Correlation Coefficient | .920** | .938** | .892** | .888** | 1.000 |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | . |
| | N | 84 | 84 | 84 | 84 | 84 |

**. Correlation is significant at the 0.01 level (2-tailed).

*Source: The raw data were extracted from the GIEWS database, compiled and analysed by the author*

## Appendix 8 - Spearman's correlation test results on year to year decadal rainfall from 2007 to 2013

| | | Quantity of decadal rainfall for 2007 | Quantity of decadal rainfall for 2008 | Quantity of decadal rainfall for 2009 | Quantity of decadal rainfall for 2010 | Quantity of decadal rainfall for 2011 | Quantity of decadal rainfall for 2012 | Quantity of decadal rainfall for 2013 |
|---|---|---|---|---|---|---|---|---|
| Quantity of decadal rainfall for 2007 | Correlation Coefficient | 1.000 | .472** | .484** | .522** | .541** | .530** | .590** |
| | Sig. (2-tailed) | . | .004 | .003 | .001 | .001 | .001 | .000 |
| | N | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| Quantity of decadal rainfall for 2008 | Correlation Coefficient | .472** | 1.000 | .287 | .411* | .613** | .470** | .624** |
| | Sig. (2-tailed) | .004 | . | .089 | .013 | .000 | .004 | .000 |
| | N | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| Quantity of decadal rainfall for 2009 | Correlation Coefficient | .484** | .287 | 1.000 | .279 | .234 | .451** | .440** |
| | Sig. (2-tailed) | .003 | .089 | . | .099 | .170 | .006 | .007 |
| | N | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| Quantity of decadal rainfall for 2010 | Correlation Coefficient | .522** | .411* | .279 | 1.000 | .463** | .548** | .579** |
| | Sig. (2-tailed) | .001 | .013 | .099 | . | .004 | .001 | .000 |
| | N | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| Quantity of decadal rainfall for 2011 | Correlation Coefficient | .541** | .613** | .234 | .463** | 1.000 | .492** | .479** |
| | Sig. (2-tailed) | .001 | .000 | .170 | .004 | . | .002 | .003 |
| | N | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| Quantity of decadal rainfall for 2012 | Correlation Coefficient | .530** | .470** | .451** | .548** | .492** | 1.000 | .621** |
| | Sig. (2-tailed) | .001 | .004 | .006 | .001 | .002 | . | .000 |
| | N | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| Quantity of decadal rainfall for 2013 | Correlation Coefficient | .590** | .624** | .440** | .579** | .479** | .621** | 1.000 |
| | Sig. (2-tailed) | .000 | .000 | .007 | .000 | .003 | .000 | . |
| | N | 36 | 36 | 36 | 36 | 36 | 36 | 36 |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

*Source: The raw data were extracted from the GIEWS database, compiled and analysed by the author*

## Appendix 9 - Spearman's correlation test results on year to year monthly rainfall from 2007 to 2013

| | | Quantity of monthly rainfall in 2007 | Quantity of monthly rainfall in 2008 | Quantity of monthly rainfall in 2009 | Quantity of monthly rainfall in 2010 | Quantity of monthly rainfall in 2011 | Quantity of monthly rainfall in 2012 | Quantity of monthly rainfall in 2013 |
|---|---|---|---|---|---|---|---|---|
| Quantity of monthly rainfall in 2007 | Correlation Coefficient | 1.000 | .701* | .772** | .670* | .838** | .893** | .655* |
| | Sig. (2-tailed) | . | .011 | .003 | .017 | .001 | .000 | .021 |
| | N | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Quantity of monthly rainfall in 2008 | Correlation Coefficient | .701* | 1.000 | .479 | .412 | .768** | .755** | .642* |
| | Sig. (2-tailed) | .011 | . | .115 | .183 | .004 | .005 | .024 |
| | N | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Quantity of monthly rainfall in 2009 | Correlation Coefficient | .772** | .479 | 1.000 | .530 | .569 | .739** | .778** |
| | Sig. (2-tailed) | .003 | .115 | . | .076 | .053 | .006 | .003 |
| | N | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Quantity of monthly rainfall in 2010 | Correlation Coefficient | .670* | .412 | .530 | 1.000 | .665* | .729** | .664* |
| | Sig. (2-tailed) | .017 | .183 | .076 | . | .018 | .007 | .018 |
| | N | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Quantity of monthly rainfall in 2011 | Correlation Coefficient | .838** | .768** | .569 | .665* | 1.000 | .840** | .643* |
| | Sig. (2-tailed) | .001 | .004 | .053 | .018 | . | .001 | .024 |
| | N | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Quantity of monthly rainfall in 2012 | Correlation Coefficient | .893** | .755** | .739** | .729** | .840** | 1.000 | .687* |
| | Sig. (2-tailed) | .000 | .005 | .006 | .007 | .001 | . | .014 |
| | N | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Quantity of monthly rainfall in 2013 | Correlation Coefficient | .655* | .642* | .778** | .664* | .643* | .687* | 1.000 |
| | Sig. (2-tailed) | .021 | .024 | .003 | .018 | .024 | .014 | . |
| | N | 12 | 12 | 12 | 12 | 12 | 12 | 12 |

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

*Source: The raw data were extracted from the GIEWS database, compiled and analysed by the author*

## Appendix 10 - Kruskal-Wallis Test on decadal rainfall estimates for Dikhil region from 2007 to 2013

| | Decadal rainfall estimates for Dikhil |
|---|---|
| Chi-Square | 3.787 |
| df | 6 |
| Asymp. Sig. | .705 |

*Source: The raw data were extracted from the GIEWS database, compiled and analysed by the author, 'df' refers to 'degrees of freedom' and 'Asymp. Sig.' refers to the 'significance level'.*

## Appendix 11 - Kruskal-Wallis Test on monthly rainfall estimates for Dikhil region from 2007 to 2013

| | Monthly rainfall estimates for Dikhil |
|---|---|
| Chi-Square | 2.758 |
| df | 6 |
| Asymp. Sig. | .838 |

*Source: The raw data were extracted from the GIEWS database, compiled and analysed by the author, 'df' refers to 'degrees of freedom' and 'Asymp. Sig.' refers to the 'significance level'.*

## Appendix 12 - Pearson's correlation test results between length of stay and length of last drought

| | | Length of stay (in years) | Duration of last drought (in years) |
|---|---|---|---|
| Length of stay (in years) | Pearson Correlation | 1 | .453** |
| | Sig. (2-tailed) | | .006 |
| | N | 45 | 36 |
| Duration of last drought (in years) | Pearson Correlation | .453** | 1 |
| | Sig. (2-tailed) | .006 | |
| | N | 36 | 37 |

**. Correlation is significant at the 0.01 level (2-tailed).

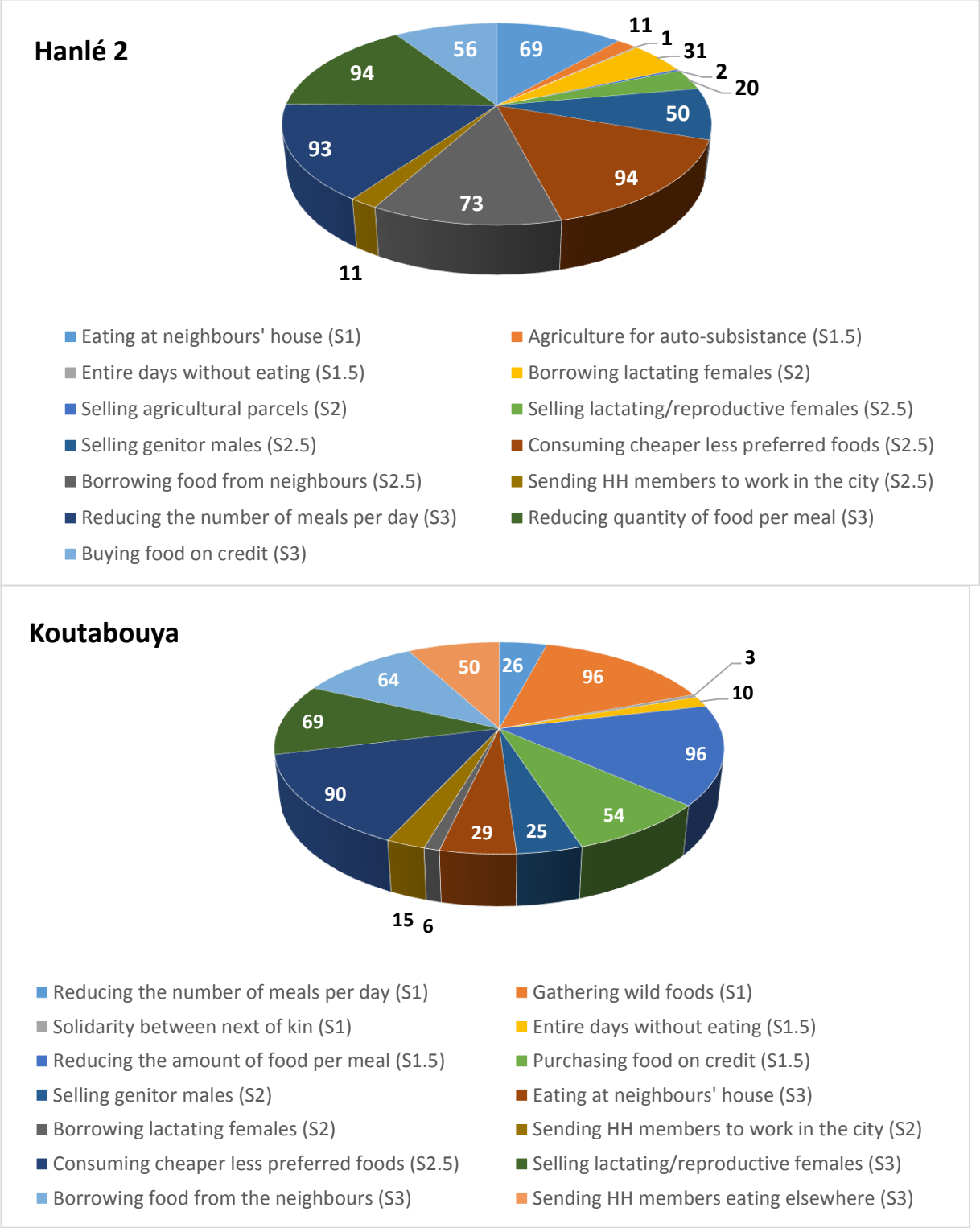
*Source: Author's research*

## Appendix 13 - Review table on the role of stress in decreasing immune function

| Study Number | Date published | Elevated stress decreases immune function | Citations | Sources |
|---|---|---|---|---|
| 1 | 2014 | Yes | [Interleukin 10 (IL-10), similarly to EBV, is a protein involved in the inhibition of the synthesis of a number of cytokines produced by certain immune cells]; IL-10 was remarkably activated following chronic stress | (Hu et al., 2014) |
| 2 | 2012 | Yes | Chronic stress enhances progression of acute lymphoblastic leukaemia | (Lamkin et al. 2012) |
| 3 | 2012 | Yes | Increasing evidences from animal and human studies demonstrate that psychological stress leads to immune dysregulation and may promote the initiation and progression of atherosclerosis | (Gu et al. 2012) |
| 4 | 2012 | Yes | Critical illness stress induces lymphocyte dysfunction associated with deficiencies in zinc and selenium and amino acids. | (Carcillo et al. 2012) |
| 5 | 2007 | Yes | Associations between psychological stress and disease have been established, particularly for depression, CVD, and HIV/ AIDS | (Cohen et al. 2007) |
| 6 | 1993 | Yes | Work from their laboratory shows that the cellular immune response in medical student subjects under stressful conditions is down regulated across many immune measures | (Glaser et al. 1994) |
| 7 | 1993 | Yes | Results of these analyses show substantial evidence for a relation between stress and decreases in functional immune measures | (Herbert et al. 1993) |
| 8 | 1991 | Yes | Evidence for reactivation of latent Epstein-Barr virus (EBV) (herpes virus) was found in medical student subjects under stress | (Glaser et al. 1991) |
| 9 | 1987 | Yes | Reactivation of latent EBV and therefore poorer cellular immune control of latent virus and increase in the incidence of self-reported symptoms of infectious illness during stress examination periods | (Glaser et al. 1987) |

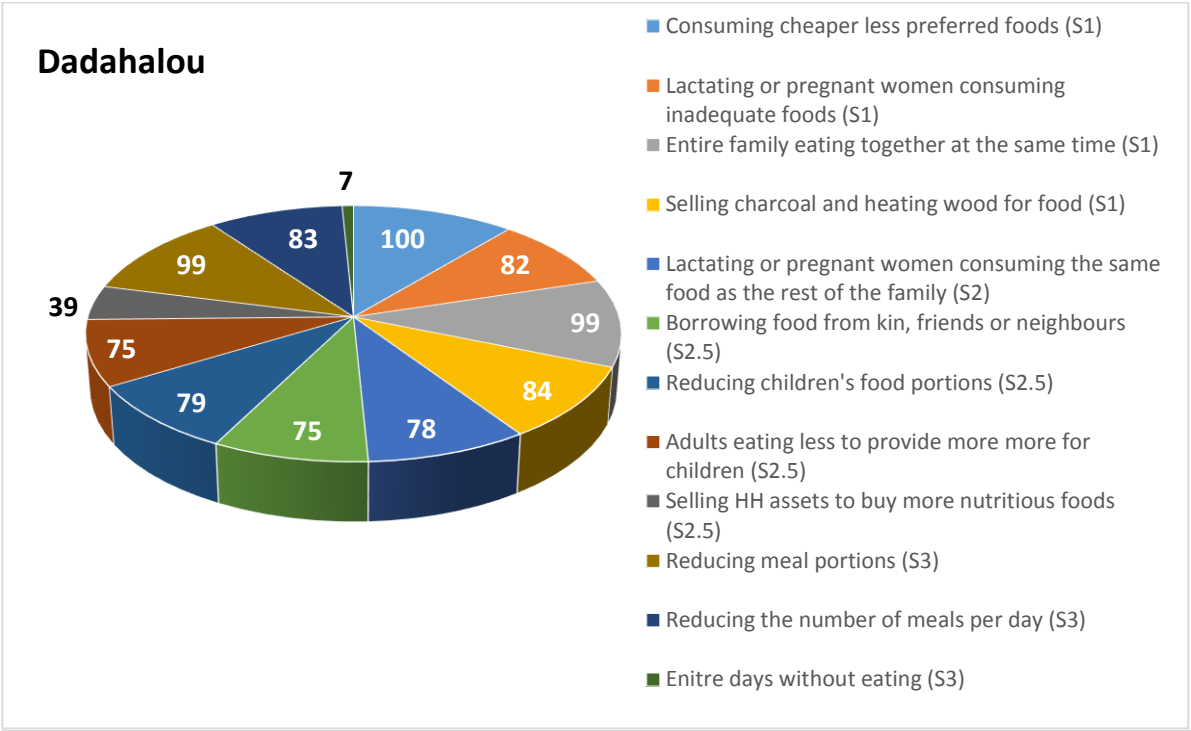
*Source: Author's research*

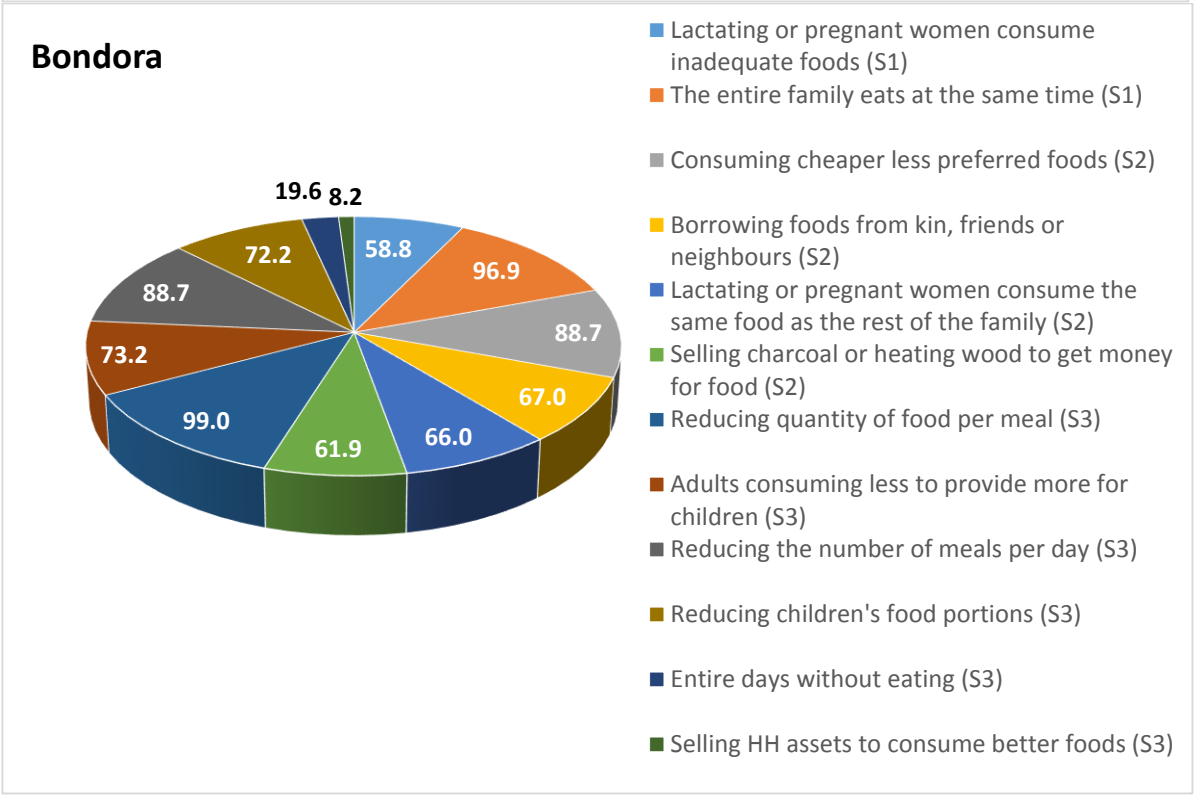
## Appendix 14 - Total number of respondents having used each coping strategy at least once in the last seven days in Hanlé 2 and Koutabouya




*Source: Author's research, HH(s) stands for Household(s)*

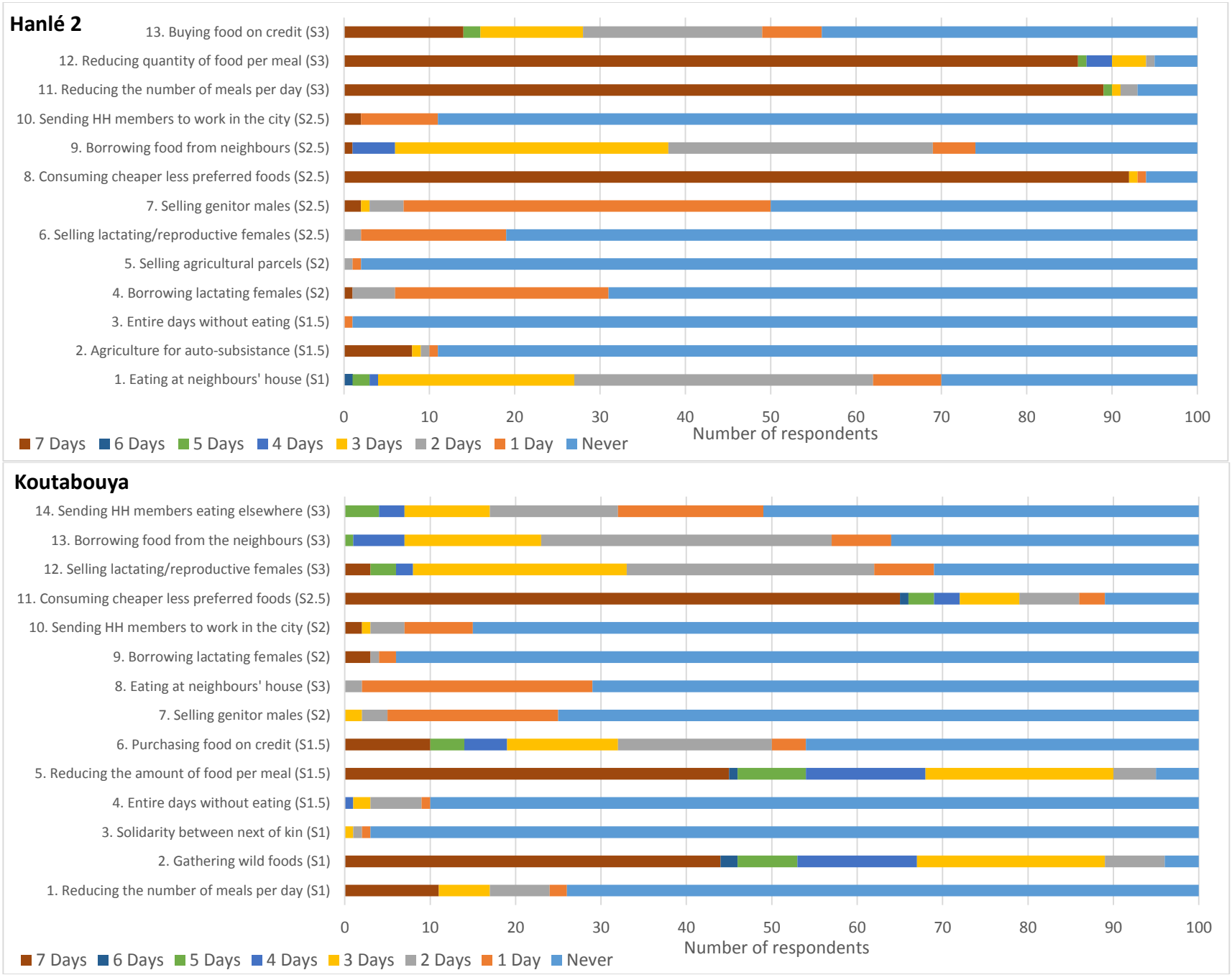
## Appendix 15 - Total number of respondents having used each coping strategy at least once in the last seven days in Dadahalou and Bondora



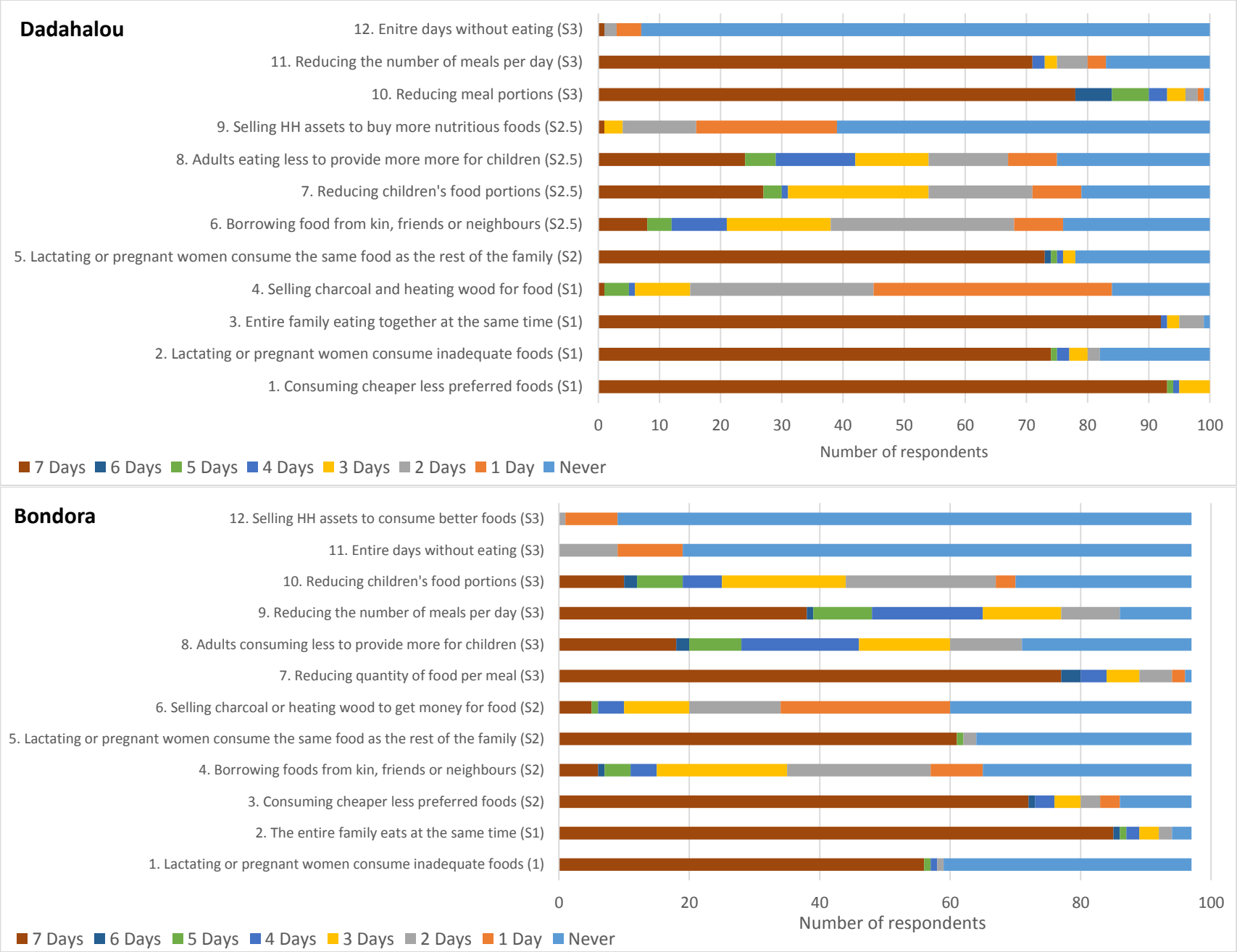

*Source: Author's research, HH(s) stands for Household(s)*

**Appendix 16 - Number of respondents having used each coping strategy by use frequency in the last seven days in Hanlé 2 and Koutabouya**




*Source: Author's research*

**Appendix 17 - Number of respondents having used each coping strategy by use frequency in the last seven days in Dadahalou and Bondora**




*Source: Author's research*

## Appendix 18 - Ethical approval

**Research Ethics Office**

Research Ethics Officer
Room K0.58
The Strand
London WC2R 2LS
Tel 020 7848 1440
Email daniel.butcher@kcl.ac.uk
www.kcl.ac.uk/research/ethics

KING'S College LONDON

Ayanleh Daher Aden,
Department of Geography,
14th February 2011,

Dear Ayanleh,

**REP(GGS)/10/11-9 'The Political Ecology of Risk and Actor-networks: a socio-environmental explanation of vulnerability to drought in the Republic of Djibouti.'**

I am pleased to inform you that the above application has been reviewed by the GGS Research Ethics Panel that FULL APPROVAL is now granted.

Please ensure that you follow all relevant guidance as laid out in the King's College London *Guidelines on Good Practice in Academic Research* (http://www.kcl.ac.uk/college/policyzone/attachments/good_practice_May_08_FINAL.pdf).

For your information ethical approval is granted until the 13th February 2012. If you need approval beyond this point you will need to apply for an extension to approval at least two weeks prior to this explaining why the extension is needed, (please note however that a full re-application will not be necessary unless the protocol has changed). You should also note that if your approval is for one year, you will not be sent a reminder when it is due to lapse.

If you do not start the project within three months of this letter please contact the Research Ethics Office. Should you need to modify the project or request an extension to approval you will need approval for this and should follow the guidance relating to modifying approved applications: http://www.kcl.ac.uk/research/ethics/applicants/modifications.html

Any unforeseen ethical problems arising during the course of the project should be reported to the approving committee/panel. In the event of an untoward event or an adverse reaction a full report must be made to the Chairman of the approving committee/review panel within one week of the incident.

Please would you also note that we may, for the purposes of audit, contact you from time to time to ascertain the status of your research.

If you have any query about any aspect of this ethical approval, please contact your panel/committee administrator in the first instance (http://www.kcl.ac.uk/research/ethics/contacts.html). We wish you every success with this work.

With best wishes

D A Butcher

Daniel Butcher
Research Ethics Administrator

## Appendix 19 - Fieldwork Risk Assessment

Department of Geography
King's College London
Strand Campus
London WC2R 2LS

### Individual Fieldwork Risk Assessment Form (Staff and Students)

*Note: Please read the 'Department of Geography, Code of Conduct for Safety in the Field'. This form should be completed electronically, printed in triplicate, the three copies signed and countersigned, and lodged with your supervisor, the Department Office and one for retention by yourself **before** fieldwork commences. This form must be completed for **any and all fieldwork** taking place outside the Department of Geography including laboratory work outside College premises.*

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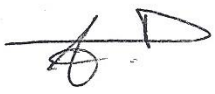
| | |
|---|---|
| **Name** | Ayanleh Daher Aden |
| **Project title** | Food insecurity and vulnerability to droughts in rural Djibouti |
| **Dates** | 21/03/2011 to 21/09/2011 |
| **Location** | Dikhil and Tadjourah Regions in the Republic of Djibouti |
| **Contact address** | Flat 7, Carter House, Brune Street, Spitalfields, London, E1 7NN, England, United Kingdom |
| **Contact phone** | |
| **Mobile phone** | 07974661522 |

*Checklist*

| | |
|---|---|
| Have all necessary permissions been sought and documents obtained? | YES |
| Have all vehicle drivers been properly instructed and their eligibility to drive checked? | YES |
| Has adequate insurance been obtained in accordance with College regulations? (application form http://www.kcl.ac.uk/geography/internal/forms/travel_insurance.pdf) | YES |

**Signature of Fieldworker**



**Countersignature** *(Students – Research Supervisor, Research Staff – Project Leader, Academic Staff – Head of Department)*

**Name of Countersignatory** Dr Deborah Potts

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## Risk Assessment

1. *Identify risks in relation to the following headings*
2. *Categorise risks as **High/Medium/Low***
3. *Specify steps taken to minimise risks including prior information gathering, specifying formal procedures, planning and reconnaissance, equipment/clothing provision, skills training etc*

**Natural Physical Hazards**
*(extreme weather/mountains/cliffs/marshes/quicksand/water etc)*

Low

Steps taken to minimise risk

Prior consultation with local officials about possible natural physical hazards will be sought.

**Biological Hazards**
*(dangerous plants, animal, insects/harmful soil and water micro-organisms etc)*

Low

Steps taken to minimise risk

Prior consultation with local officials about possible chemical hazards will be sought. Malaria: appropriate prophylaxis will be taken for the area.

**Chemical Hazards**
*(pesticides/dusts/contaminated soils/chemicals brought onto site etc)*

Low

Steps taken to minimise risk

Prior consultation with local officials about possible chemical hazards will be sought.

**Societal and Other Hazards Affecting Personal Safety**
*(potentially dangerous equipment/buildings/quarries/slurry pits/powerlines/pipelines/vehicles/traffic and transport situations of all kinds/exposure to infection/exposure to criminal activity etc)*

Low

Steps taken to minimise risk

For traffic safety, I will be circulating in four-wheel drive vehicles. While Djibouti has been declared a "mine-safe" country, prior consultation about the safety of unpaved roads to be taken will be sought to minimize this risk.

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## Emergencies

**Specify any relevant medical/health problems that might arise**

Malaria, Dengue Fever, Tuberculosis

**Name of next of kin and full contact details**

Dr Daher Daher Aden, Street 211, buidling 7 Maadi, Cairo, Egypt. Telephone: +20165513147

**Details of the Hospital Accident and Emergency Department or other medical assistance nearest to the fieldwork site**

# Research Ethics – Risk Checklist

- Complete the checklist ticking yes to any of the sections relevant to your study.
- Submit the checklist along with your application to the committee, ensuring each copy of the application has a checklist attached on top.

| | |
|---|---|
| **Name:** | Ayanleh Daher Aden |
| **Review Committee:** | King's College London Research Ethics Committees (Geography, Gerontology, SCWRU for SSPP) |
| **Title of Study:** | The Political Ecology of Risk and Actor-networks: a socio-environmental explanation of vulnerability to drought in the Republic of Djibouti |

| | | Yes | No |
|---|---|---|---|
| **A** | Does the study involve **participants who are particularly vulnerable** or unable to give informed consent or in a dependent position (e.g. children, your own students, over-researched groups, people with learning difficulties, people with mental health problems, young offenders, people in care facilities, including prisons)?<br><br>**If you have ticked yes to this section,** will **financial incentives** (other than expenses) be offered to participants? **YES** ☐ **NO** ☐<br>**If yes, please state how much.** | ☐ | ☒ |
| **B** | Will participants be asked to take part in the study without their consent or knowledge at the time or will **deception** of any sort be involved (e.g. covert observation of people in non-public places)? | ☐ | ☒ |
| **C** | Is there a risk that the highly sensitive nature of the research topic might lead to **disclosures** from the participant concerning their own involvement in illegal activities or other activities that represent a threat to themselves or others (e.g. sexual activity, drug use, or professional misconduct)? | ☐ | ☒ |
| **D** | Could the study induce **psychological stress or anxiety**, or produce humiliation or cause harm or negative consequences beyond the risks encountered in normal life? | ☐ | ☒ |
| **E** | Does the study involve **physically intrusive** procedures?<br>**<u>If yes</u>, continue below:** | ☐ | ☒ |
| **i** | Does the study involve **only moderately** intrusive procedures *(taking less than 40ml blood, collecting bodily waste, cheek swabs)*? | ☐ | ☐ |
| **ii** | Are substances to be administered (such as **food substances**) which are **<u>not</u>** classified as 'medicinal products' by the MHRA? (see 15c of the guidelines for more details) | ☐ | ☐ |

| | | | |
|---|---|---|---|
| **iii** | Are substances which are classified as **'medicinal products'** by the MHRA to be administered? (see 15c of the guidelines for more details) | ☐ | ☐ |
| **iv** | Does the study involve **imaging techniques** such as MRI scans, x-rays or ultrasound? | ☐ | ☐ |
| **V** | Does the study involve **DNA or RNA** analysis of any kind? (see Appendix D)? | ☐ | ☐ |
| **vi** | Are invasive, intrusive or potentially harmful procedures **not already covered** by items i, ii, iii, iv, & v to be used in this study? | ☐ | ☐ |

## Appendix 20 - Information Sheet and Consent Form for Participants

# INFORMATION SHEET FOR PARTICIPANTS

*REC Reference Number:*

**YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET**

**Title: Food Insecurity and vulnerability to droughts in rural Djibouti**

We would like to invite you to participate in this postgraduate research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

**What is the purpose of this study?**
This study investigates your lived experiences of drought-related events. More specifically, we are interested in finding out the factors that increase the vulnerability of your household in times of drought. Also, we would like to know how your household has been able to cope with these events and the adaptation strategies used to overcome your food deficits.

**Why have I been chosen?**
As a household head and/or wife, you are being invited to take part in this study. You have been chosen because we believe you are in a good position to offer insight into your traditional lifestyle, your beliefs and values, your role in the community and the management of household food insecurity in times of drought. We also believe you are in a good position to express views about external aid you may or may not have received during these drought events.

**Who must we exclude?**
Unfortunately, we must ask you to *not* participate if your household did not suffer any signs of food insecurity in the past. This is because this study is especially directed to households that have experienced food insecurity in times of drought in the past.

**What will participation involve?**
The interview can be carried out in whichever place that is most convenient to you. The interview will be based around a semi-structured interview pattern and will take approximately 50-60 minutes. It is intended as an opportunity for you to express any past/current food deficits your household has experienced, the impacts of drought(s) on your livelihood, the coping and adaptation strategies you have adopted to overcome these difficulties and the extent of external aid you have received.
The interview will be tape recorded, and later transcribed into text form. Recordings of interviews will be deleted upon transcription.

**Are there any benefits involved in participating?**
You would be very welcome to have a copy of the final report.

**How will we maintain your privacy and confidentiality?**
As part of the presentation of results, your own words may be used in text form. This information will be anonymised in a way that the responses you have provided to us can't be used to identify you. All of the research data will be stored as a hard copy at King's College London for 2 years.
Please note that:

- You can decide to stop the interview at any point
- You need not answer questions that you do not wish to
- Your name will be removed from the information you provide and anonymised. It will not be possible to identify you from the responses you may give to us.

**Can I withdraw from the study at any time?**
It is up to you to decide whether to take part in this study or not. If you decide to take part, you are still free to withdraw from it at any time up until the 31st September 2011 and without giving a reason. If you withdraw from the study, any data that you have given us will be withdrawn and destroyed.

If you decide to take part in this study, you will be given this information sheet to keep and be asked to sign a consent form.

If this study does you harm in any way, please feel free to contact King's College London using the details below for further advice and information.

**Ayanleh Daher Aden**
Department of Geography,
King's College London,
6th Floor, Strand Campus, London,
WC2R 2LS, United Kingdom.
Email: ayanleh.daher_aden@kcl.ac.uk
Telephone. +44 07974661522

**Dr Deborah Potts**
Room K4L.05
Department of Geography,
King's College London,
4th Floor, Strand Campus, London,
WC2R 2LS, United Kingdom.
Email: debby.potts@kcl.ac.uk
Telephone. +44 020 7848 1572 or +44 0207848 2632/1054 (administrators)
Fax. +44 020 7848 2287

**THANK YOU**

## CONSENT FORM FOR PARTICIPANTS IN RESEARCH STUDIES

**Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.**

**Title of Study: __Food Insecurity and vulnerability to droughts in rural Djibouti____**

**King's College Research Ethics Committee Ref:_____**

**Thank you for considering taking part in this research. The person organising the research must explain the project to you before you agree to take part. If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.**

**Please tick or initial**

- **I understand that if I decide at any time during the research that I no longer wish to participate in this project, I can notify the researchers involved and withdraw from it immediately without giving any reason. Furthermore, I understand that I will be able to withdraw my data up to the point of publication *[OR insert date if stated on Information Sheet].*** ☐
- **I consent to the processing of my personal information for the purposes explained to me. I understand that such information will be handled in accordance with the terms of the Data Protection Act 1998.** ☐
- **I consent to my interview being recorded.** ☐
- **The information you have submitted will be published as a report and if requested, you will be sent a copy. Please note that confidentiality and anonymity will be maintained and it will not be possible to identify you from any publications.** ☐

**Participant's Statement:**

**I _____**

**agree that the research project named above has been explained to me to my satisfaction and I agree to take part in the study. I have read both the notes written above and the Information Sheet about the project, and understand what the research study involves.**

**Signed Date**

**Investigator's Statement:**
**I _____**
**Confirm that I have carefully explained the nature, demands and any foreseeable risks (where applicable) of the proposed research to the participant.**
**Signed Date**